THE PRACTITIONER

THE PRACTITIONER

LONDON:
PRINTED BY EYRE AND SPOTTISWOODE, LTD.
HIS MAJESTY'S PRINTERS,
EAST HARDING STREET, E.C. 4.

P
Med
P

THE

PRACTITIONER

V 100

JANUARY—JUNE 1918

531149
10. 12. 51

"THE PRACTITIONER," LIMITED:
HOWARD STREET, STRAND, LONDON, W.C 2
1918.

All Rights Reserved.

R
31
P7
v.100

THE PRACTITIONER.

JANUARY, 1918.

MENTAL WAR CRIPPLES.

By SIR GEORGE H. SAVAGE, M.D., F.R.C.P.

Consulting Physician to Guy's Hospital, etc.

Some years ago I gave an address on mental cripples, and since I have studied the provisions in contemplation for the re-education of physical cripples my thoughts have been centred on the parallel cases due to partial or incomplete recovery from mental disorders.

I am constantly seeing the after-effects of nervous breakdowns in Army men. "Shell shock" is now one of the common terms in medicine, and that and neurasthenia are only too common objects of discussion.

The crippling to which I shall refer in this article does not only follow shell shock or even actual military service. It may follow any form of mental disorder. It may be a gradual development or it may come on suddenly. It may show itself in many forms. In most cases it may be looked upon as a partial dissolution, represented by some definite loss of power and some uncontrolled action. It varies a good deal according to the temperament and the education of the patient. The profession, too, may have a very distinct effect on the symptoms. As a rule, it shows either pronounced defect of function or decided want of control.

As Hughlings Jackson has pointed out, the defect of some function often leads to loss of control over, or exaggerated action of, a lower function. Loss of control, as seen in anger, may lead to excessive muscular action in facial expression and in muscular expression and violence.

Some of these cripplings are well seen in toxic neuroses. Repeated excess of alcohol leaves the patient more and more incapacitated. First, his work, especially if it is of a high or very skilful nature, loses its refinement, next, power of judging and of willing are defective. Good intentions fail and bad habits are established, that is, actions are not controlled or directed normally. Later on, want of refinement and lack of control are followed by loss of memory.

Often the loss of memory is the most prominent of the early symptoms, and with the mental cripple it is often not recognized by the patient himself. This loss of memory is a very interesting and important symptom, and one in which the prognosis is unfavourable. Real loss of power in any organ is of grave import, whereas mere irregular action, though it be very intense, may be corrected.

At one time, I was inclined to consider loss of memory due to toxic causes as very unfavourable, and in fact beyond recovery if it had lasted for some time after complete recovery from the true toxic symptoms. It is interesting, by the way, to recognize the active and passive symptoms of such defect. Take alcohol, for example. A patient who has been a deep and constant drinker, may for a time return to his normal sober state, no longer desiring alcoholic stimulant.

One of the most difficult points to decide in these toxic cases is as to how far they have recovered.

Not long ago I had to visit an elderly man who had led a very irregular and intemperate life. The object of my visit was to decide as to his testamentary capacity. With other doctors and his lawyer, I listened to the reading of his Will and cross-examined him about it. He was reasonable and clear in all he said, and we agreed that he was sane and capable of signing his will. In six weeks after this, having made great physical improvement, he again asked me to see him about his Will. He had no memory of having seen me or of signing any document, and he did not agree with some of the provisions of the first will, yet we all believed that he had regained full mental capacity. He was so far crippled.

This defective memory, though very advanced and interfering with present plans and ordinary forms of social life, may yet be sound enough in relationship to past events. I recall cases in which patients did not remember anything which had happened five minutes before, but when asked about the value and the disposal of property, were quite clear. For example, an elderly gentleman who received me as a stranger half a dozen times in an hour, yet when asked if he would sell a certain property, always made a wise provision as to retaining a certain part which would in time be needed by a railway. Whenever asked about his property he always made the same provision, yet all recent memory was gone. Similar defects follow shell shock, local head injury, or gas poisoning.

After some fevers, particularly after typhoid, these defects occur. I shall give some special cases in more detail later.

The special causes of mental crippling in war cases vary, though the results, the symptoms, may be similar. Simple shock from the physical and moral strain produced by war conditions may suffice without physical injury. Injury, whether to the head or to the body, may induce mental disorder. I have seen mental disorder follow gas attacks, and, to complete my list, I must add as causes febrile diseases such as typhoid or malaria.

The effect may be "facility" and loss of stability, or definite loss of ability, and these will be considered in more detail.

More or less complete defect may be seen in functional paralysis, and return or reversion to disorders of development such as epilepsy following infantile convulsions. Allied to the above, I should place the re-development of old diseases such as malaria and syphilis.

I will now take these in order, and it is to be understood that any one of the causes given may be followed by any of the forms of defect to which I refer.

The loss of aptitude is very common, and often is very hard to cure; as I have said, this is well seen in the alcoholic and in the general paralytic, as well as in shell-shock cases. All crispness in reaction has disappeared, and he passes from uncertain gait and alteration in speech and writing to complete inability to perform actions, which had become almost automatic.

I have known an officer quite unable to give a simple word of command. The patient is perfectly aware of his weakness, and this may give rise to mental depression and to delusion as to his military unfitness, having caused disaster for which he ought to be court-martialled.

Long after all evident symptoms of shell-shock or allied disorders have passed, this disability may persist, and it requires very patient re-education. Like most of the disorders about which I am speaking, simple restful surroundings are required and the slow steady development of interests. The treatment is best carried out in association with other patients in some home-like colony rather than in big institutions or small isolated homes.

Next to ability, I refer to stability, and here I have to consider conditions allied to neurasthenia. I have seen a good many patients who, after a period of rest, appear to be well, and who are anxious to have their liberty. Though they feel they are not fit for military work, many such are surprised to find how easily they become fatigued, and they soon break down again if they do not accept this warning. Here, again, out-of-door simple life for some months is needed for cure.

Instability and defect of self-control are closely related. I have met big, healthy-looking young men, who had so little self-control that, when asked the simplest question, they burst out into hysterical sobbing. Such cases require sympathetic but judicious neglect. They may be told it is only evidence of nervous disorder, and is in no way equivalent to hysteria. This reassures the youth that he is not feminine.

Under the same heading I place the patients who are easily misled. I have been consulted about young fellows who, at school and university, bore good characters and who, up to the time of injury or shock, have been straight, but who, after that, were constantly in trouble, at first, perhaps, for only slight stupid actions, but later for grave breaches of military regulations. Sober men have given way to drink, honest men have taken to pilfering, and many, after leading chaste lives, have abandoned themselves to promiscuous sexual indulgence.

One might enlarge indefinitely on the various forms of social and moral disorder which may result from lack of stability. In many of these patients the feeling of weakness leads to dependence on others, and these others are often of the easy-going or ill-regulated type.

Occasionally grave sexual faults have followed loss of stability.

The tendency to drink is probably the most common result of the weakness, and the temporary restoration of some power leads to further indulgence. Many of the cases, as a result of head injury, are rendered more susceptible to the influence of stimulants. I have heard of patients of this kind, who have taken to drugs to induce sleep or to restore confidence. I fear such cases come from the medical side chiefly, but in my experience they are few.

Under the class of instability, I may refer to cases of relapse. I have met with some young men who have had acute attacks of insanity after exposure to military trials, and I have learnt later that they had had similar attacks before.

So much has been written about the functional losses of the senses, that I shall not devote much attention to this, but, first of all, defect of memory of very various kinds and degrees may follow war injuries. I have described the former associated with alcoholism, but here I will speak more of the cases following direct injuries to the head.

Take the case of a man of middle age, who had led a sober, healthy, country life. A fall from a horse caused insensibility for some hours, but he soon appeared to be himself again, but it was at once recognized by others, though not by himself, that all power of registering recent events had been lost. He did not seem distressed when he found he was not in his old surroundings, but did not know he was in hospital. His sleep, appetite, and general functions were normal. He could not find his way about the hospital, and when asked the name of the doctor or nurse he always made the same remark, that of course he knew who they were, but forgot their names.

I have said all degrees of loss of memory are to be met with. In some there was a distinct gap in the memory. For example, the patient had lost all recollection of his life for several years before the accident. From the recovery of consciousness after the accident a more or less accurate memory existed. In other cases, the loss has been from the time of the accident, there being no knowledge of how or where it took place. These cases varied greatly in their improvement, some very slowly regained a recollection of the past, the memory wound being slowly scarred over.

The mental cripples with defects of memory need time and great patience, and, I fear, if there is no gain in three months the prognosis is very bad. In some cases, there is a tendency to permanent instability, represented by recurrent mania, and such attacks often tend to permanent mental weakness. Many of these cases pass into permanent mental defectives, but under supervision may become the hewers of wood and the drawers of water for institutions, leading a placid and passionless life, often of long duration.

The losses of sight, hearing, and speech, have been fully considered by others, and I need add but little. If sensory or motor defects have lasted for six months and have not been improved by "suggestion" and hospital treatment, it is certain that prolonged re-education will be necessary, and the parallel between the physical and mental cripples is well-marked, and I believe similar treatment, even to the use of hydrotherapy and electricity, will be of service.

With many of the cases of functional paralysis, there is also a certain amount of mental weakness or mental confusion, and I have been in the habit of saying that many such have mental and motor incoherence.

I hardly know of any of these functional disorders which may not recover, and some, after prolonged but unsuccessful treatments, recover suddenly as the result of some physical or moral impression.

I have referred to hysterical symptoms which may persist after other symptoms have disappeared, and, what is more alarming, is the existence and persistence of epileptic symptoms.

I believe Dr. Mott was the first to point out that in many of the cases in which epilepsy has developed as the result of war conditions, there was a history of convulsions or fits in earlier years. Certainly I have met with such cases, and every form of epilepsy may be produced, ranging from "petit mal" to "l'épilepsie larvée" with periods of automatic unconsciousness and complicated acts.

In some cases somnambulism has returned, so that a man of twenty goes through similar mental and physical experience to that of ten years earlier.

In my experience many of these epileptics recover, but many remain very unstable, and are liable to relapse at once when again sent back to military duty. I am convinced that some of them require colony life and training for a period of years. Other neuroses of earlier years may be re-developed, and, this is very noteworthy, such cases require time to regain the lost years.

From the above it is only a short step to consider the recrudescence of the symptoms due to some latent poison. Many of the cases of G.P.I., which had had syphilis some years before and seemed to have been cured, developed signs of brain or cord syphilis after some local or general shock or injury. I cannot speak dogmatically from my limited experience, but I have been struck by the occurrence of specific brain symptoms which have developed after shock or injury within a few years of the syphilitic infection.

I have met with cases, too, in which old malarial troubles have reappeared. Men, who had suffered in former years in foreign countries from malaria, after the stress of recent campaigns showed signs of the same disease. I regret that I cannot record any confirmation of the diagnosis by blood examination.

And now to sum up what, after all, is but a sketch of my personal experience. I have thought it better thus to write than to refer to the vast and accumulating mass of observations of others.

A very large number of soldiers and sailors will, after the war, be found more or less crippled, that is, unfit to perform their normal and accustomed duties, and they will need special treatment, and in some cases they will have to learn fresh work. For such patients, whatever they are, physical or mental cripples, I believe colonies in the country will be found to be the most beneficial. It will have to be considered whether such colonies should be special or general. My own opinion is that for epileptics the colony should be special, but that for other nerve disorders a union with other sufferers might be found useful, as drawing the patient away from his subjective state to one of more active objective sympathy.

THE TREATMENT OF TUBERCULOUS DISEASE OF THE LARGER JOINTS AND OF THE SPINE.*

By SIR HERBERT F. WATERHOUSE, F.R.C.S.

Senior Surgeon to Charing Cross Hospital, and to the Victoria Hospital for Children.

On the subject of tuberculous disease of the larger joints and of the spine, time will only permit me to refer to certain points, and I must confine my remarks almost entirely to the non-operative treatment.

I wish to direct your attention especially to the treatment of the early cases, and to urge, at the outset, the vital importance of early treatment in tuberculous disease of the joints and the spine. Early treatment naturally demands early diagnosis, and the practitioner who can make a correct diagnosis, before the tuberculous process has caused destructive and degenerative changes, will obtain infinitely better results than his colleague who allows incalculably valuable time to be lost before instituting treatment. Never use the word "cure" in connection with tuberculous disease; the best you can do by treatment is to assist Nature in encapsulating the tuberculous focus by means of fibrosis. Tuberculous lesions heal by fibrosis, in contradistinction to pyogenic lesions, which heal by phagocytosis.

Let me say a few words on the subject of tuberculin treatment. I have a profound faith in tuberculin as a remedy for surgical tuberculosis. It is a potent remedy, but it must be used with discretion. The vital question is the dosage, and on this point I confess that I can give no definite rules to guide you. In my experience, almost all patients benefit from the administration of the drug, provided that it is given intelligently, but I have found it impossible to predict, in any individual patient, the amount of the drug that will prove of the greatest service. I always employ Koch's New Tuberculin, known as "T.R.," which is prescribed thus—"Koch's New Tuberculin T.R." In every instance I begin with a minimum dose of 1/20,000th m.g., given by subcutaneous injection.

---

* A clinical lecture delivered at Charing Cross Hospital.

I wish to draw special attention to the method of dosage that I employ. I start with a dose of 1/20,000th m.g., and at the end of seven days repeat it, giving a course of twelve weekly injections, the last of which amounts to 1/1,000th m.g., that is to say, twenty times the original dose. It may interest you to know the actual doses.

They are:—

First - - -	1/20,000th of a m.g.	
Second - -	1/15,000	,,
Third - -	1/12,000	,,
Fourth - -	1/8,000	,,
Fifth - - -	1/6,000	,,
Sixth - - -	1/4,000	,,
Seventh - -	1/3,200	,,
Eighth - -	1/2,400	,,
Ninth - -	1/1,800	,,
Tenth - -	1/1,500	,,
Eleventh - -	1/1,200	,,
Twelfth - -	1/1,000	,,

It may help you to remember about the dosage if you will bear in mind that you start with 1/20,000th m.g. of New Tuberculin, that you give twelve doses—that is to say, one a week—that your last dose is 1/1,000th m.g., and that you never so much as double the previous dose. Roughly speaking, the increase is something like 40 or 50 per cent., each time in greater strength than the one before. In general, a thousandth of a milligramme is the maximum dose I employ; but in certain cases which bear the drug well, and in which it seems to be further indicated, I give eight more injections, namely, 1/900th, 1/800th, 1/700th, 1/600th, 1/500th, 1/400th, 1/300th, and 1/250th of a milligramme. Beyond a dose of 1/250th m.g. I have never ventured. With doses such as I have indicated, any reaction, whether general or local, is the exception. Should, however, a decided reaction occur after any dose, the same dose must be repeated and not increased next time. Suppose, in a given case, you have gone on safely until you have got to 1/4,500th m.g., but after that dose the patient's temperature rises a couple of degrees, and he has malaise, perhaps pain, or, if the lesion is superficial, there is redness about it, then you will not increase the dose, but repeat 1/4,500th m.g. next time; in 98 cases out of 100 there will then be no reaction.

In tuberculosis, the power of resistance varies extraordinarily in different tissues, that is the resistance to the tubercle bacillus. One may say that this power of resistance is at its maximum in the peritoneum, and at its minimum in the meninges. The meninges have practically no power of resistance to tubercle bacilli. The other tissues are intermediate, in this respect, between the peritoneum and the meninges. The power of resistance to the bacillus also varies very greatly at different ages, being at its maximum in childhood, and definitely decreasing as age advances.

This leads me to mention the subject of *senile tuberculosis*. Tuberculous disease of joints after 50 years of age is not nearly so uncommon as is usually believed, and is especially prone to occur in the knee-joint. Senile tuberculosis is characterized by the chronicity of its course; it lasts, in these subjects for years, instead of months, before destruction of the joint takes place. It is also characterized by the fact that operative treatment—which, in the case of the knee, usually means amputation—is almost always demanded, owing to the poor resisting power offered by the tissues to the invading bacilli.

I will not occupy your time by repeating the essentials of the general treatment of tuberculosis—medicinal, dietetic, and so on—but you will understand that general treatment in tuberculosis of the larger joints and the spine, and of all other forms of the disease too, should never be omitted. You will take it, therefore, that when I mention treatment, I understand you appreciate the fact that general anti-tuberculous treatment must simultaneously be employed.

Now, Bier's hyperæmic treatment is an invaluable adjunct in all cases of tuberculosis of the joints of the limbs, that lend themselves to treatment by an elastic bandage gently constricting the lower part of the thigh or the upper arm. You will notice that this excludes the shoulder and the hip. I have had no success with the application of a Bier's bandage in cases of hip-joint disease, and in my hands it has only given moderate success in the treatment of shoulder-joint disease. But for all the joints below the upper arm and below the thigh, Bier's bandage should be used as a routine treatment. This method of therapeusis, that is, Bier's hyperæmic treatment, is far too little employed in this country. The points to be aimed at are: that the bandage shall retard the venous return, so that the limb below it becomes moderately swollen and congested, and pits on pressure; that no pain is caused by its application; and that it is employed for from 18 to 22 hours per diem. My experience of Bier's hyperæmic treatment is, that it is almost always wrongly applied; the doctor puts the bandage on either too tightly, and causes pain, or too loosely, so that no hyperæmia is produced. It takes some time to reach the golden mean. An intelligent patient, in nine cases out of ten, soon learns to apply just the amount of constriction required, and so, in almost every case, after the first four or five days, I leave it to the patient to apply the bandage himself.

I next desire to speak of the injection of iodoform and glycerine emulsion, a 10 per cent. emulsion. This remedy is of great value, and I employ it constantly in these cases. Its action is due to the nascent iodine injected into the joint-cavity, or into the synovial membrane, producing a fibrosis, and thus leading to the encapsulation of the tuberculous focus. The injection of this emulsion may be repeated fairly frequently. In general, not more than ½ drachm of iodoform should be employed at one injection, that is to say, 5 drachms of the emulsion, for fear of causing iodoform poisoning; in most cases, less than half this amount suffices. Its value is particularly great in the treatment of tuberculous abscesses, especially in connection with disease of the spine. Such abscesses should be incised, washed out with sterilized normal saline solution, and then the wound closed after the introduction into the abscess cavity of the iodoform and glycerine emulsion.

Now, if to-day you learn nothing more than what I am about to say, it will be something which it is of the utmost importance you should not forget: *never, under any circumstances, insert a drainage tube into a tuberculous abscess.* If you do, a mixed infection with pyogenic organisms will certainly take place, sooner or later. Remember that tuberculosis without superadded sepsis is very rarely fatal, except when it attacks the meninges. When tuberculosis kills, it does so usually because a mixed infection of pyogenic organisms has been allowed to become established.

The treatment of surgical tuberculosis of the joints and spine should be conservative to begin with in almost every early case, because, in comparison with operative treatment, it offers, in general, far better functional results and a distinctly lower mortality.

Rest is of prime importance in this disease. It must cause absolute immobilization of the diseased part, until pain, tenderness and muscular rigidity have vanished. Over and over again I am asked these questions: "How long am I to keep on the splint;" "How long am I to keep on extension?" My answer is: "Do not leave it off, if pain, tenderness, or muscular rigidity is present." In your treatment by immobilization, always keep in view that the subsequent utility of the part demands that the position must be that in which the part will be most useful to the patient. It is a poor thing to have healed a tuberculous hip, but to leave the limb so abducted and so shortened that it is useless. Always bear in mind, then, that you have not only to try and heal the tuberculosis, but that you have to heal it in such an attitude that the patient may derive the greatest amount of benefit from the limb, or the spine, as the case may be. I care not how you attain absolute immobility of the part, provided that you accomplish your aim. Splints, weight-extension, plaster of Paris bandages, or other methods may be employed.

Operative treatment in tuberculosis of the larger joints and the spine is called for more often in the case of adults than of children, because, in the former, there is a smaller chance of natural recovery, and there is no danger of interfering, by operation, with the growth of the bones owing to damage to the epiphysial lines.

In regard to situation of the primary focus in tuberculosis of joints, remember that, in infants, in whom the epiphysis is cartilaginous, the disease must be implanted in the synovial membrane. Tubercle, as a primary infection, cannot attack cartilage, because it is a blood-borne infection, and cartilage is non-vascular. In children, however, as opposed to infants, in the great majority of instances, the primary focus is situated in the bony epiphysis; tuberculosis in the shaft is extremely rare. In adults, the synovial membrane is the usual site of tuberculous invasion.

After these preliminary observations, we will now discuss at some length, tuberculous disease of the hip and of the knee, and then refer briefly to the affection as it concerns the ankle, the shoulder, the elbow, and the wrist-joints.

Tuberculosis disease of the hip joint—the morbus coxæ of the older writers—is essentially a disease of childhood, As the disease progresses, the head of the femur is absorbed, and absorption takes place in the acetabulum in an upward and backward direction, so that the neck of the femur (the head having been absorbed) tends to be, as it is termed, dislocated on to the dorsum ilii. This is usually not a true dislocation, because, although the head of the bone is apparently well up on to the dorsum ilii, absorption of the back part of the acetabulum has caused, as a rule, such an enlargement of the acetabulum, that the neck of the femur is really resting in an enlarged acetabulum. This condition is sometimes known as "wandering acetabulum," the acetabulum having extended and wandered on to the dorsum ilii.

The prognosis of tuberculous disease of the hip is always grave, and is certainly worse than that of tuberculous disease in any other of the great joints of the limbs; it is only less grave than disease of the spine itself. Cases of tuberculous disease of the hip, even if they are seen very early, will generally require eighteen months of treatment, and it is wise to warn the parents that some degree of impairment of the function of the joint may result. Most cases, however, recover, if treated with care, and the results of non-operative treatment are certainly far superior to those obtained subsequent to operation. Conservative treatment must here be your rule.

The first indication, in treating tuberculous disease of the hip, is absolute rest of the joint and separation of the softened bony ends. This is accomplished by putting the patient to bed and applying weight-extension with the limb in the abducted position. It is abducted because if absorption of the femoral head occurs, the neck of the femur will, by abduction, be directed into the acetabulum. It is obvious that the more we abduct, the more the head of the femur will go into the acetabulum, or, if the head has been absorbed, the more the neck will go in. The weight-extension prevents the contracted muscles from pushing it firmly into the acetabulum, where the softened neck of the femur would only be further absorbed. The weight used for this purpose should, in my opinion, be heavier than that usually recommended. On the average, I suggest that you should begin with from 2 lbs. to 6 lbs. for a child of seven years and under; 5 to 10 lbs. for one between seven and 14 years old, and 10 to 15 lbs. for adolescents and adults.

The object of applying this weight-extension is to separate the softened bony ends, and it is better to begin with too much rather than too little weight-extension. But if, in two or three days' time, pain occurs in consequence of the stretching of the ligaments, the weight must be somewhat reduced. The relief of pain from this measure should be almost immediate. I will here emphasize a point of prime importance, which is that abduction, to prove effective, must be bilateral. Abduction of the affected limb alone, such as I see employed in nine cases out of ten in conjunction with weight-extension for hip disease, is useless or nearly so. What happens when this is done is that, with the child lying on its back and one limb abducted, the pelvis immediately tilts over towards the abducted limb, so that the other, the sound limb, is brought parallel with it. The sound limb, therefore, should be abducted to the same extent, but with no extension; it is fixed in position by a sand-bag, applied to its inner margin.

As soon as weight-extension has done its work, the next step is taken. But we must first make sure that the affected limb has been brought into good position and that all pain, tenderness, and muscular spasm have disappeared. Then some form of ambulant treatment must be made use of, so as to enable the patient to get about on crutches; for this purpose, no splint has given me so much satisfaction as Thomas's hip splint, with a patten attached to the sole of the boot of the sound limb.

Tuberculous disease of the knee-joint may occur at any age. I have seen it start at six months of age and I have seen it at 80 years. The initial focus of disease is usually stated in your text-books to be about as frequently in bone as in synovial membrane. My experience, as surgeon to a large children's hospital for a quarter of a century, has taught me that a bony primary focus exists in almost every case of knee-joint tuberculosis in children. In adults, I admit, the disease generally starts in the synovial membrane. In children, the bony primary lesions are situated about as frequently in the tibia as in the femur. Tuberculosis of the knee commonly manifests itself as a diffuse infiltration and thickening of the synovial membrane, the typical "white swelling" of the older authors. Not infrequently in this joint, hydrops tuberculosis, described by the late Professor König, occurs. This hydrops I have seen chiefly in patients from 14 to 24 years of age. It is important, because it generally results in a practically complete cure, if treatment by Bier's hyperæmia bandage, repeated injections of iodoform-glycerine emulsion, and immobility is carried out. A less common variety of disease, which is mostly confined to adults, is the papillary form of synovial tuberculosis, which runs a very chronic course.

As regards the attitude of the limb, it must always be remembered that a knee-joint affected with tuberculosis tends to assume the position of flexion, because the position in rest of any joint in the body is that of slight flexion. Once slight flexion has started, the flexor muscles being more powerful than the extensors, the ham-string muscles continue the flexion; and in old-standing cases the ham-string muscles may cause a considerable backward displacement of the tibia on to the femur. Then, again, in many cases, combined with flexion there is an external rotation of the tibia. This is due to the fact that the biceps—by far the most powerful of all the ham-string muscles, though only a single muscle—often causes some external rotation in addition to causing flexion. All three deformities may exist combined; the knee may be flexed, it may be rotated externally, and it may be displaced backwards on the femur.

With regard to treatment, we must differentiate between children and adults. If tuberculosis in the knee in adults is at all advanced, operative treatment, though it results in ankylosis, is usually indicated, owing to the much lessened power of resistance. On this point I have no doubt whatever; the older the patient, the greater is the call for operative treatment, for the patient's power to heal tuberculous disease diminishes rapidly as age advances. In children, however, operative treatment should certainly be the exception, not the rule. Children's power of resistance against tubercle is far greater, and in them we should avoid, as far as possible, any interference with the epiphysial lines. This point, important in regard to the disease anywhere, is doubly important in the case of the knee. The epiphyses, in which the greatest extent of growth takes place, are those at the lower end of the femur and at the upper end of the tibia, and these are the epiphyses, which are in danger in operations for tuberculosis of the knee. The treatment must be by weight-extension, rest in bed, the application of Bier's bandage above the knee, and the administration of iodoform-glycerine injections. As soon as pain, tenderness, and muscular spasm have disappeared, get the patient up, put on a Thomas's splint, with a patten attached to the boot of the sound foot, and let the patient move about on crutches.

The remaining four large joints of the limbs must be dismissed with only the briefest mention.

Tuberculosis of the ankle-joint is usually synovial in origin. As regards treatment, fix the foot at a right angle with the leg, in a poro-plastic, leather, or plaster of Paris splint, apply Bier's bandage above the knee, and inject into the joint iodoform-glycerine emulsion. The disease is often met with in adults, but the prognosis is relatively good, amputation being very rarely demanded.

Tuberculosis of the shoulder-joint is usually met with in adults. The prognosis, I think, is better than that of the disease in any of the other six large joints. Frequently, in the shoulder-joint, the tuberculosis assumes the form of caries sicca, that is to say, dry caries, and the course of disease is exceedingly chronic. The head of the humerus is often completely absorbed. Fibrous ankylosis is the usual sequence, but, in spite of this, the patient can usually raise his arm to a right angle with the trunk, owing to movement of the scapula. That is one of the factors which make the after-result of ankylosis of the shoulder so, comparatively, satisfactory. For treatment, fix the limb in slight abduction, with the elbow flexed, and the thumb directed upwards. Almost certainly there will be ankylosis, so you had better have the humerus somewhat abducted. Inject iodoform-glycerine emulsion into the joint.

In tuberculosis of the elbow-joint, conservative treatment frequently secures recovery with a movable articulation. The forearm tends to assume a position, in which it forms with the upper arm an angle of about 130°, the hand being pronated. I want to impress this point upon you. The position is a very characteristic one. Should ankylosis occur in this position, the utility of the limb will be very small. This is a good instance of the value of considering the after-use of the limb. What you have to do, then, is to fix the tuberculous elbow in such a position that the forearm makes, with the upper arm, an angle just less than a right angle, and with the hand semi-pronated, that is, with the thumb pointing upwards. In that position, should ankylosis result, one can feed oneself, shave, and do a number of things; in the other position, the patient can do practically nothing with the limb. Often it is necessary to give an anæsthetic in order to get the limb into the useful position. Bier's bandage should be applied to the upper arm, and the iodoform-glycerine injections complete the treatment.

Tuberculosis of the wrist-joint may occur at any age. The majority of the cases of this condition that I have seen have been in adults, and the situation of the primary lesion has been in the synovial membrane. The hand and fingers are flexed, and there is a bulbous swelling on the wrist. My experience of this form of tuberculous disease has been a doleful one. Operative treatment of it has generally been demanded, and, in the final result, there has usually been not a very useful hand, occasionally amputation has been required. In order to render such a hand at all useful, you must dorsiflex it. The forearm, wrist, and hand must be fixed in some immobile apparatus, which is usually a leather or poro-plastic splint. A Bier's bandage is then applied to the arm, and, again, iodoform-glycerine injections are made use of.

I have now only a little time left, in which to refer to *Tuberculous disease of the spine,* or Pott's disease. This usually starts, in children, as a tuberculous osteomyelitis of the anterior part of the bodies of one or two vertebræ. In the very large majority of cases, you will find that the child has sustained some accident from three to six weeks prior to the onset of the pain. Nothing, in my experience, has been more constant, when a child is brought with tuberculosis of the spine, than the fact that it had dropped out of its "pram" a month before, or had fallen downstairs; there was some traumatism of the spine, and then the tubercle bacilli fixed themselves in the *locus resistentiæ minoris*. In adults, spinal disease begins, as a rule, as a tuberculous periostitis, just subjacent to the anterior common ligament, usually involving several vertebræ at a time. The characteristic deformity, resulting from the collapse of a single vertebræ in a child, gives rise to the marked angular or V-shaped dorsal projection; you get the typical kyphotic angle, a point almost like a spear head, which is so characteristic of the disease in children. This is hardly ever observed in adults, for, in such cases, owing to several vertebræ being involved just under the periosteum, the curve is a much more gradual one. The two curves are readily diagnosed from each other.

The diagnosis of tuberculous disease of the spine in children is, as a rule, quite easy. The case is quite different, however, in adults. In the great majority of the cases of early tuberculosis of the spine in adults, which have been brought to me, an erroneous diagnosis has been made. I would urge you to suspect the existence of the disease in adults who complain of pain in the back, which increases towards evening and is relieved by rest in bed, and who present the symptom of localized rigidity of spinal muscles, and have, too, perhaps, a slight dorsal convexity, with usually an evening elevation of temperature a degree or so. You may find no more symptoms than these for several months.

Tuberculous abscesses occur with unfortunate frequency in connection with tuberculosis of the spine, and these are relatively far more frequent in adults than they are in children. Should such abscesses burst spontaneously, or be drained, as I have already warned you, mixed infection with pyogenic organisms inevitably occurs, sooner or later, and may lead to a fatal result. One of the greatest surgeons of all time—Syme—who lived in pre-antiseptic days, and was the father-in-law of Lord Lister, used to say, "Never open a psoas abscess; if you do, the patient invariably dies." His reason was that, with the lack of antiseptic and aseptic treatment when these abscesses were opened and drained, in every case a mixed infection occurred. Therefore, never allow such an abscess to burst spontaneously, and never insert a drainage tube into it, or you will be simply asking for that awful complication, a mixed infection in a loculated tuberculous abscess.

Not infrequently paraplegia occurs in connection with tuberculous spinal disease. It is, as you would expect, almost always a motor paralysis, because the motor neurons are situated in the anterior segment of the cord, and it is that segment which will be affected. The sensory spinal nerves, being situated posteriorly in the cord, are usually not compromised, they are certainly not involved at the beginning. When paraplegia develops in connection with spinal tuberculosis, it is hardly ever—I may almost say never—due to the angular curve. When you see the V-shaped curve in the child, you will notice that the child's spine is bent like a hinge. The child may have paraplegia, and the natural presumption is that the spinal cord has been doubled up. As a matter of fact, that is a condition never seen. The paraplegia is always due to the development, around the meninges of the cord, extra-durally, of tuberculous granulation tissue, what is known as tuberculous granuloma; this compresses the cord.

In this connection I offer you a word of warning. I am frequently requested by practitioners and physicians to perform laminectomy, for the relief of paraplegia in tuberculous disease of the spine. In 19 cases out of 20, however, I decline to do so, and I have very rarely regretted my decision. What I do advise is weight-extension for from six to twelve months, and in the majority of cases the paraplegia then disappears. I do not say that laminectomy is never necessary, but the necessity for its performance is a decided exception. When a vertebral body has crumpled up, owing to tuberculosis, and the spine has lost its body, which is the chief support in this region, the integrity of the spine obviously depends upon the neural arch. It is, I think, manifestly very poor surgery to take away, by means of laminectomy, this last remaining support; and such a course is still worse surgery, because the majority of these cases recover without any operative treatment at all, simply by giving rest and applying extension.

Time will not permit me to discuss tuberculous disease of the spine in its various regions. I can, therefore, only give you an outline of the broad principles of treatment of spinal tuberculosis.

The first desideratum is perfect rest in the recumbent position in bed, without a pillow; and this must be maintained for months, until all pain, tenderness, and muscular rigidity have disappeared. Extension and counter-irritation should be applied in all acute cases, and the general treatment of tuberculosis employed, including the administration of tuberculin. When the disease appears to be quiescent, a double Thomas's splint, or, in the case of young children, a Phelps's box, enables the patient to be carried out into the fresh air, though this advantage of fresh air can be equally well obtained by wheeling the patient's bed out of doors.

Remember, then, that extension and absolute rest are the basis of the treatment of spinal tuberculosis. Do not flatter yourself that you have done your duty to a patient, who presents any symptom of tuberculosis of the spine, if you have merely encased him in a plaster of Paris jacket and allowed him to walk about. Such modified rest is a surgical abomination. If rest is needed, let it be absolute. In such a case, modified rest is of about as much value as modified honesty.

In the treatment of surgical tuberculosis of the spine and joints, there comes a day when the patient and his friends feel quite sure he may discard with safety his splint or his extension, and begin to get about. Urgent and persuasive appeals will be made to you to give your consent. The weaker among you may fail to resist those appeals. Should you, unwisely, give your consent to the carrying out of movement before you are satisfied that it can safely be undertaken, you may take it from me that the blame for any set-back will be your portion. I would urge you to persist with rest and immobility three months too long, rather than permit movement one week too soon, because my experience has been that a recrudescence of the disease is far more difficult to treat successfully than the original lesion.

INDIGESTION.

A SCHEME OF TREATMENT.

By GUTHRIE RANKIN, M.D., F.R.C.P.

Consulting Physician to the Dreadnought, and Royal Waterloo Hospitals.

There is no disturbance of health more frequently met with than that which, from one cause and another, interferes with the unconscious process of a normal digestion.

In the case of almost every organic disease, the gastric functions become upset sooner or later, and the miseries of indigestion are added to the symptoms and signs of the primary ailment. It frequently happens, too, that indigestion arrives with an absence of other appreciable organic lesion, and then requires to be looked at as of independent origin. Whether, in many cases of apparent idiopathic development, there is not an undiscovered causative influence elsewhere in the tissues is very doubtful. There is good reason for suspicion that in many such instances obscure chemico-biological changes, which we are unable to discover, may exist, and be responsible for the earliest departures from the normal, to which the gastric manifestations are subsequent events.

It is along this line of inquiry that the question of inherited tendencies acquires importance, both from the ætiological and treatment points of view. Often a history of rheumatism, gout, tuberculosis, or neurasthenia, running through a long gamut of family history, gives the clue to the disturbance of tissue balance that leads up to gastric instability. The mass of literature that has accumulated around the question of indigestion has led to such confusion of a clear conception of functional irregularities, that attempts on the part of the practitioner to establish a well-defined mental picture of the fundamental factors essential to a simple working scheme of diagnosis and treatment are concealed under a bewildering entanglement of theory and empirical practice. It may be affirmed safely of digestive disturbances, taken in the mass, that they are recognized and treated on such diverse principles, and with such an individual bias on the part of the practitioner to preconceived ideas, derived from his undergraduate training, and to subsequently acquired conceptions which have arisen from the promulgation in the medical press of one hypothetical explanation after another, that he finds himself ultimately lost in a perplexity of chaotic indecision as regards dietetic and medicinal procedure.

The many classifications that have been put forward have no doubt, each one of them, something to be said in its favour, but they are so numerous, and overlap one another at so many angles, that a more simple presentation of a subject, admittedly complex, may at least conduce to a workable differentiation for purposes of practical management.

Putting to one side all considerations of ætiology, round which so much variety of opinion has found expression, a simple plan, founded upon a symptomatological basis, may not be unacceptable as a means of escape from much of the confusion that now presents so many difficulties to the clinical observer. Into every form of indigestion, faults of secretion, of innervation, and of motility enter, and give individuality to each case according as one or other predominates. But behind these functional manifestations of disturbed balance, there exists a toxæmic condition upon which they are more or less dependent. If this ætiological antecedent is borne in mind, it becomes easy to formulate a plan of treatment which will be found, in the majority of cases, efficacious, due regard being paid to the adaptation of drugs to meet the indications of the type of case to be dealt with, and to compliance with the necessary dietetic restrictions.

For practical purposes, all cases of indigestion may be relegated to one of two classes, which may be conveniently designated tonic and atonic.

The tonic type of case occurs equally among men and women, but perhaps more frequently in the former. The patient is usually well-nourished, full-blooded, active, and possessed of a good appetite that cannot be satisfied because of the discomfort which ensues some hours after the ingestion of a meal. The symptoms comprise pain coming on two or three hours after food, accompanied by heart-burn, water-brash, epigastric fulness and tenderness, eructations, flatulent distension, dilatation of the stomach, and constipation, often accompanied by stools defective in bile. The discomfort is intensified by overwork or mental strain, and is often first experienced after a period of months or years when life has been over-strenuous, and no sufficient opportunities for rest and relaxation have been obtainable. It is, under these circumstances, really a fatigue dyspepsia, and, from the co-existence of hunger-pain, hyperacidity, and localized tenderness to the right of the epigastrium, is often diagnosed as duodenal ulcer. Though such a fault of gastric secretion may, in some cases, be the prelude to an ulcerative process in the duodenum, it is certain that, in many instances, a premature diagnosis of ulcer is arrived at. In the absence of hæmorrhage or of occult blood in the stools, the possibility of ulceration is frequently negatived by complete disappearance of the symptoms under the influence of medical and dietetic treatment. So often is this the case that it is justifiable to postpone any thought of surgical interference until medical measures have failed, or the occurrence of hæmatemesis or melæna has given indubitable proof of a breach of the peptic mucous surface, either on the stomach or duodenal side of the pylorus. In cases of this type, it is necessary to bear in mind two other important possibilities which may demand surgical help; the first, that the gall-bladder may be implicated either from the existence of stones, or from a mild and chronic condition of cholecystitis, which is responsible for the symptoms; and the second, that the appendix may be at fault, and by reflex irritation be the cause of pyloric spasm and excessive gastric activity. When one or other of these lesions enters into the causation of the miseries accompanying tonic dyspepsia, the stomach symptoms have obviously no chance of being relieved, until the source from which they originate is discovered, and the faults existing there corrected.

Here are short synopses of three cases taken from my note-books, illustrative of this tonic type of indigestion, and also of some of the side results by which it may be accompanied :—

Case i.—A. B., an active, robust-looking man of 41 years of age, first seen on April 3rd, 1917, had suffered for upwards of nine years from indigestion, of which the leading symptoms were fulness and discomfort at the pit of the stomach, coming on from two to three hours after a meal, and always relieved by more food, or by bi-carbonate of soda. Constant heart-burn and flatulence, but no vomiting. Sleep good as a rule, but sometimes disturbed between 2 and 3 a.m., on account of pain in the stomach, which is relieved by eating one or two dry biscuits. His discomfort always increased after any time of unusual strain or worry.

On examination, his pulse was 80, full and regular; his heart was of proper size, with slight accentuation of the second aortic sound; and his lungs were normal. Over the right epigastrium there was localized tendernes on deep pressure, and the lower border of the stomach was at the level of the umbilicus. There was no tenderness in the appendical region. He had not lost weight, and complained of no undue sense of weariness, but only of apprehension lest this long-continued discomfort might be due to a growth or ulcer. His bowels were always constipated, and his urine was normal.

On June 14th, he was much better and had lost most of the pain and heart-burn. He was given more liberty in diet, and still continued to improve steadily. When last seen on September 14th he reported himself as quite well, and free for several weeks from discomfort of any kind. Between April and September he gained five pounds in weight.

Case 2.—C. D., a spare, active man of 38 years of age, first seen in March, 1917, had recently gone through a very strenuous time. For some years he had suffered from indigestion of the typical tonic type ; epigastric pain some hours after meals, relieved by more food, heart-burn, flatulence, constipation, disturbed sleep, occipital headaches, and an active appetite which he feared to indulge. His symptoms had been much worse since an attack of dysentery in Egypt in 1916. In 1911, he had his gall-bladder drained, and his appendix removed, but, though his digestion temporarily improved, his nervous system seemed never to get stable after his operation and all the old troubles referable to his stomach returned. He was neurasthenic and exceedingly introspective. His sleep was much disturbed at night, and he was restless and depressed. On examination, there was decided tenderness to the right of the epigastrium, and his stomach was moderately dilated with a well-marked succussion splash. His cæcum was distended, but not painful anywhere to pressure. His scar was at times tender, and raised doubts as to post-operative adhesions. His heart and lungs were normal. His complexion was toxic, and he complained often of muscular pains which he believed were rheumatic.

He was treated in a nursing home on the lines suggested in this paper, and at the end of six weeks was much improved. He then went to the country, and on his return in July was still better, having only suffered from one slight gastric attack during all the time of his residence out of town.

Case 3.—E. F., a robust, well-nourished, florid man, seen first in March, 1917, had lived long in South Africa. For quite ten years he had suffered from indigestion, for the cure of which he had sought much medical advice. Six months ago he was short-circuited in the belief that he was the victim of a duodenal ulcer. After a short interval of increased comfort, his gastric symptoms returned with increased intensity, the heart-burn, water-brash, hunger-pain, flatulence, epigastric fulness, and constipation being as bad as ever. He had observed that his stools were frequently very pale in colour, when the indigestion was specially acute. There was no history at any time of hæmatemesis or melæna, and, though subject to nausea, he had never been actively sick. For two months after first coming to see me he was not aware of any improvement in his symptoms, but this was possibly due to a succession of domestic and business worries, which kept his nervous system unceasingly "on end." In August, he went for a long and restful holiday in a quiet and retired part of the country, and returned at the end of September a new man. So long as he exercised care as to his dietary, and continued to observe a wise control over expenditure of energy, he now had no digestive discomfort, was able to sleep the night through, and was free from mental depression. The tenderness over his epigastrium had disappeared, he had no longer either heart-burn or flatulent distension, and he was able to get through a considerable amount of business every day, with all his old grip of things and without undue fatigue.

The atonic cases are met with most frequently in women, but also in men who are of poor physique, and whose cachectic appearance suggests, in the absence of organic disease to account for it, an imperfect metabolism. The patient suffering from this variety of indigestion is always badly nourished, often anæmic, and slack in regard to all activities both mental and physical. Neurasthenic manifestations are constant, with mental depression, introspection, and languor as prominent features.

The digestive discomforts are more or less continuous, though increased by every meal that is taken. No sooner is food swallowed than there is a sense of fulness and epigastric uneasiness, which never entirely dies away and is at once increased by the taking of more food. Eructations are constantly indulged under the belief that comfort is thereby promoted; there is a feeling of nausea which relieves itself from time to time by vomiting, either spontaneous, or produced by the deliberate act of the patient.

The bowels are obstinately constipated, and the motions are, as a rule, offensive and scybalous. There is little or no heartburn, but semi-digested food regurgitates into the mouth constantly, and the breath is heavy or even offensive. This gives rise to a sense of self-consciousness, which drives the patient to avoid the society of neighbours and relatives. Anorexia is pronounced, and one article of diet after another is discarded under the belief that it must be responsible for the miseries that are making life unendurable.

The patient loses flesh, and in time becomes obsessed by the notion that cancer or some other incurable condition must be at the back of the symptoms which seem to yield to nothing that is suggested for their relief. The stomach is flabby, dilated, and splashy. The skin becomes greasy and inelastic. The circulation is feeble, and a systolic murmur not infrequently develops to the accompaniment of a weak, irregular, and rapid pulse. The nervous system is disturbed, and multifarious neurasthenic manifestations become added to the burden of the patient's distress. Evidences of colonic irritation by-and-bye enter upon the scene, and muscular pains, which are attributed to rheumatism, assist in the completion of a truly miserable picture. Any extraneous strain or worry intensifies the symptoms, and leads to sleepless nights following upon comfortless days. The patient is never free from the knowledge of a rebellious inside, and attention becomes so riveted on the digestive discord that the condition has been descriptively stated as one of having the stomach on the brain. In the case of women, the symptoms are aggravated at the menstrual periods, and they are apt to become more conspicuous and intractable on the advent of the menopause.

In the history of all patients who belong to this category of dyspepsia, two important predisponents are frequently in evidence—a neurotic ancestry, and a life history that has been more than ordinarily beset by poverty or mental anxieties. The following cases illustrate the type :—

CASE I.—A. B., a lady 53 years of age, was spare, anæmic, listless, and worn-looking. She only weighed 7 st. 6 lbs., when first seen. Though always of spare habit of body, she thought she had lost a considerable amount in weight within the past two or three months. Throughout her life she had never been dangerously ill, but from adolescence she had not known what it was to be strong. Her lifelong troubles were centred round her digestive organs, and she had not been, for any consecutive length of time, free from the necessity of treatment. One method of management after another did her good for a time, but unfailingly there came a relapse, which threw her back to where she was before the last plan of drugs and diet had been started. She had observed that most occasions of a set-back coincided with the onset of a menstrual period. Recently, since she started upon the transitional time of her menopause, she suffered continuously, and was worse than ever before. She related an endless array of symptoms, and described her experience of every conceivable form of treatment. Her life, indeed, had been spent in the worship of her digestive organs, and she was disappointed to find herself worse rather than better. When her long record of miseries was sorted out, the main facts were as follows: A constant sense of discomfort in the stomach; disagreeable and acrid eructations of gas; nausea and retching; abdominal distensions; loss of appetite and dislike of food; irregularity and irritability of the bowels; and distressing borborygmi. In addition to these gastric symptoms, she complained of broken and dream-disturbed sleep; daily occipital headaches; palpitations and shortness of breath; persistent languor; overpowering mental depression, and progressive loss of flesh. On examination, she was very thin and badly nourished; the tongue was thickly coated, and the breath offensive; the teeth were imperfectly looked after, though there was no actual pyorrhœa. The heart sounds were feeble and badly spaced, and there was a soft systolic murmur at the apex. The pulse numbered 100, and was compressible and feeble. The stomach was dilated below the umbilical level, and succussion sounds were easily obtained; there was also some pain to touch over the epigastrium. The liver dulness was quite an inch below the costal arch. The colon was distended throughout its length, and there was slight tenderness on pressure over the cæcum. The urine was scanty, and loaded with urates; menstruation was irregular and painful. The knee-jerks were much exaggerated, but the plantar reflexes were absent. All the muscles of the body were flabby, and poor in tone. A bismuth meal showed a retention in the stomach for 10 hours, and a very slow progress throughout the whole length of the colon, the transverse portion of which sagged down almost into the pelvis. This patient presented a very complete picture of the atonic type of indigestion, and her case is fully recounted as being descriptive of the condition, and illustrative of the points of differentiation between it and the tonic variety.

The lady was advised to go into a nursing home for observation and disciplinary treatment, but she declined to adopt this course. A plan of management at home on the dietetic and medicinal lines which are suggested in this paper was entered upon, but, as she never returned to report progress, the assumption is that the treatment failed to give relief because it was not put into proper execution, and that, like so many preceding attempts, it was given no chance of achieving success.

Case 2.—C. D., a lady, aged 32, had suffered for about three years from symptoms more or less similar to those related in the case of Mrs. A. B. She had been engaged to a man who committed suicide; previously to this occurrence, her health, though never very robust, had given her no serious trouble. Since her indigestion began, she had not known what it was to be entirely comfortable, and even when she starved herself—as she did sometimes to get relief—she experienced very little mitigation of her symptoms. When ten years of age she had enteric fever, and in 1909 an ovarian operation was performed, but she did not know its nature, nor why it was done. In this history there were, therefore, two leading events which helped to account for the breakdown of the digestive processes. She weighed only 7 st. 9 lbs., and it was obvious from her muddy complexion that she was in a toxic condition. She suffered, in addition to her digestive troubles, from sleeplessness; vertical headaches; shooting pains in her limbs; cardiac discomfort, with constantly recurring feelings of faintness; constipation alternating with diarrhœa, and stools that were always offensive, and contained frequently both mucus and blood. Her nervous system was unhinged, and her neurasthenic manifestations were almost as numerous as those emanating from her digestive organs. The pain in her stomach was so constant, and so immediately intensified by the ingestion of food, that suspicions of ulceration had to be considered. She had, however, no vomiting, and no hæmorrhage after severe retching. Two important facts removed her from the category of simple dyspepsia, and differentiated her from Mrs. A. B. The symptoms referable to her colon made it certain that microbic disturbance had set up a mild colitis in the course of her digestive troubles, and when her urine was examined it was found to be opaque, fishy, and loaded with bacillus coli. One event after another had led to a pronounced toxæmia, to which probably the atonic dyspepsia had contributed the first causative element. She improved considerably, but, when last seen, though better, she was still unstable, but more so in regard to her nervous than her digestive system. The stomach troubles were less pronounced, and she was able to take and digest comfortably a fair amount of simple and properly selected food. The colon was quiescent, and the stools had become normal in consistence and appearance. Happiness of mind, could it have been secured, would probably have made her cure complete.

The effects of indigestion upon the general economy are remarkable in several directions: on the general nutrition, which undergoes gradual impairment; on the nervous system, which gets unstable and ultimately manifests progressive evidence of neurasthenic and vaso-motor instability;

on the circulatory system, in which the poverty of blood leads to anæmia and cardiac feebleness; on the hepatic functions, which become sluggish and inadequate; on the internal secretions, whose normal balance is upset; and on the mentality of the individual, which in all sorts of unexpected ways becomes "jumpy," and changes both temperament and character beyond recognition of the original.

The treatment of both varieties of indigestion may be conveniently divided into three great measures of correction—habitual routine, dietetic correction, and medicinal alleviation.

Habitual Routine.—In every case it will be found that, in greater or less degree, the ordinary habits of life are at fault. The patient has gradually tumbled into a system of living, that is inimical to the physiological integrity of his functional activities. There is a failure to realize the necessity of attention to detail in the minor events of ordinary habits. The plan of life is constantly changed, and inadequate attention is given to the possible bearings of a well-considered and carefully maintained routine upon secure and comfortable health. He requires to be educated anew, in order to correct the errors that are contributing to a vicious circle to which he has become unconsciously a slave.

The bath in the morning should be hot—from 95° to 105°, and may be terminated, should the patient be robust enough to stand the shock, by a cold douche over the head and shoulders, the feet remaining immersed in the hot water of his bath. While in the bath, and before the cold douche, gentle, and well-sustained massage ought to be applied for a few minutes over the abdomen, one hand being superimposed on the other, thus exerting an equal pressure. A vigorous towelling ought to follow the bath, and should be succeeded by a further smart rubbing of the abdominal muscles, and followed by a short course of simple physical exercises so arranged as to bring all the voluntary muscles into active play. In vigorous patients, a weekly Turkish bath is of great service. The clothing should be arranged to meet the requirements of the weather, and provide for the comfortable protection of the surface of the body. A Curtis belt, or other suitable abdominal support, may be worn in all cases in which the walls are slack and pendulous. A daily amount of exercise in the open air is always desirable. Six to eight hours should be devoted to sleep, and a restful Sunday in bed once a month is of inestimable value. The time between the evening meal and retirement for the night may be profitably employed on some form of homely amusement. Half an hour devoted to light reading after going to bed, and before the light is put out, often promotes early sleep.

Dietetic Correction.—On inquiry into the dietetic habits of dyspeptics, it is surprising how widespread is the belief that whatever else is cut out of the daily menu—and in extreme cases almost everything in rotation seems to have been eliminated—tea, bread and butter, and sweet farinaceous puddings are always clung to as being innocuous, and beyond a possibility of doing harm. It is almost a universal gospel among all classes of society that the ultimate simplicity of food is represented by a farinaceous *régimen*. It is argued that children do well on such food, and that as simplicity is the secret of alimentary success for them, a diet upon which they thrive must be the most likely to succeed with those whose organs rebel against one thing after another, making all attempts to find a mixed diet, which will produce no discomfort, end in complete failure.

Experience in both varieties of indigestion will soon establish the fact that the first necessity in all cases is to limit the supply of sugar and starch. All fruits and vegetables that are uncooked must be forbidden. Red meat should constitute a moderate element in the bill of fare, and tea ought to be allowed once a day only, if at all. The same plan of dietary may be adopted in the initial treatment of both tonic and atonic indigestion, but an earlier elaboration of food will be found possible in cases of the tonic type. Atonic patients require time for the restoration of nervous energy and muscular vigour, before they can be expected to assimilate comfortably an ordinary mixed diet, and in them there is no better guide to a relaxation of strict dietetic rules than increase of bodily weight as an accompaniment of progressive gastric comfort. In severe cases, a good foundation may be laid by putting the patient in bed for a few days, and feeding him entirely on milk, given in quantities of three or four ounces every two hours when not asleep. The milk may be made easier of assimilation by adding to it two grains to the ounce of citrate of soda, or by having it peptonized with Fairchild's powders. After such an initial procedure, or in cases not bad enough for this degree of restriction, the following diet scheme will usually be found suitable :—

Breakfast.—Weak café-au-lait, without sugar, but sweetened, if need be, with saxin. Toasted bread (or preferably one of the proprietary breads in which the starchy element is reduced to small proportions), with butter. To this meal may gradually be added an egg—boiled, poached, or scrambled; a small piece of white fish; or oatmeal porridge with cream. (Porridge will be easier of digestion if the oatmeal of which it is made is soaked over-night in cold water.)

Luncheon.—White meat, simply cooked, in moderate amount (tripe, calf's head, sheep's brains, chicken or rabbit cream), toasted bread, or potato chips. Water biscuit thickly spread with lactic acid cream cheese. As improvement occurs, lamb, mutton, veal, chicken, or game may be allowed. Gradual additions of a purée of green vegetable, marrow, cucumber, spinach, or the flower part of cauliflower, all thoroughly cooked, are desirable. Later on stewed fruit, also in the form of a purée, and sweetened with glycerine and saccharine, may be given, and is made more attractive by the addition of cream.

In the Afternoon.—Cocoa infused from the nibs, or hot milk, with dry toast and butter.

Dinner.—Jelly made from chicken, veal or mutton, and a pudding of milk and egg (custard, omelette, or junket) with cream. Subsequently white fish, an egg entrée, any kind of bird, occasional milky farinaceous puddings and soufflées are permissible.

At Bedtime.—A cupful of hot milk, Benger's Food, Horlick's Malted Milk, or thin arrowroot is grateful, and often promotes sleep. To patients accustomed to the use of alcoholic stimulants, one tablespoonful of well-matured whiskey or brandy, taken in one of the table waters at the end of luncheon and dinner, is often advisable. In atonic cases a light red wine, or stout, may be substituted for spirits at the middle-day meal when convalescence is established.

From a restricted dietary arranged on this plan, a gradual return may be made, according to digestive capacity, to ordinary meals, but the rule of limiting red meat and tea to once a day only, of avoiding uncooked vegetables and of adhering to a small daily intake of sugar and starch should not be departed from until complete comfort is permanently restored. It is always desirable to restrict the greater portion of fluids to the end of each meal.

Medicinal Alleviation.—The dietetic treatment of both forms of indigestion aims at minimizing the tendency to gastro-intestinal fermentations, and of counteracting, as far as possible, the toxæmic intoxications which accompany, in greater or less degree, every case. Similarly, whatever medicinal plan of management is adopted, ought to aim at fortifying the dietetic restrictions, by disinfecting the gastro-intestinal tract, and by assisting nature to restore to a normal condition all the tissues and secretions concerned in the maintenance of a healthy and harmonious functional activity. In cases belonging to the tonic variety of the disorder, the leading indications are to lessen the amount of gastric secretion, and sooth the stomach mucous membrane; to steady the nervous centres; and to control microbic activity in the intestinal tract by suitable disinfectants. A combination of drugs, according to the following formula, aims at accomplishing these requirements :—

℞	Ext. Valerianæ	gr. ii.
	Acid. Carbol. pur.	gr. ii.
	Sodii Arsenatis	gr. $\frac{1}{40}$
	Codeinæ	gr. $\frac{1}{4}$
	Pil. Rhei Co.	gr. iss.
Ft. Capsul.		

One to be taken three times a day after meals.

In order to counteract the hyperacidity, a powder like this should be provided :—

℞	Magnes. Carbon.	gr. x.
	Bismuthi Carbon.	gr. xxx.
	Sodii Bicarb.	gr. xxx.
Ft. Pulv.		

One to be taken when there is heart-burn.

Also, in order to provide for the correction of hepatic inadequacy, which is a constant accompaniment, an anti-bilious pill is required for occasional use, such as the following :—

℞	Hydrargyri Subchlor.	gr. i.
	Ext. Colocynthidis	gr. iii.
	Ext. Belladonnæ	gr. $\frac{1}{8}$
	Ext. Colchici	gr. $\frac{1}{3}$
Ft. pil.		

One to be taken once or twice a week at bedtime.

A tablespoonful of liquid paraffin, taken once a day, serves to lubricate the bowel, and a simple saline, of which there is none more efficient than Rubinat Water, ought to be taken in the early morning according to requirements.

In the atonic variety of the disorder, the same considerations ought to guide the treatment, but the drugs employed require to be modified to suit the special conditions. In these cases the gastric secretion is diminished, and presumably poor in quality, the muscular vigour of the stomach-wall is feeble, and there is a decided lack of nerve energy.

Here the indications are best met by a mixture such as this :—

℞	Papain - - - - - - -	ʒ ss.
	Acid Hydrochlor. dil. - - - - -	ʒ iij.
	Glycerini Acid. Carbol. - - - -	ʒ ij.
	Liq. Strychniæ - - - - - -	ʒ j.
	Codeinæ - - - - - - -	gr. iv.
	Aq. Chloroformi - - - - - ad	℥ vj.

One tablespoonful to be taken in half a sherry-glassful of water two hours after each meal.

In extreme cases, it is sometimes more satisfactory to replace the strychnine in the above mixture by calumba or gentian, and to administer the strychnine separately by hypodermic injection twice daily.

The pill suggested for use in cases of the tonic type will also suit here, but the colchicum may be omitted. Both paraffin and Rubinat Water ought to be used in a similar manner.

When improvement has set in, and the digestive processes are being carried on so satisfactorily that a more liberal dietary can be dealt with; when sleep is better at night, and less disturbed by dreams and nightmares; when the nervous system has become more energetic; and when the mental condition is more hopeful, a change of medication is desirable in both forms of the disorder. In tonic cases, a combination of small doses of one or other of the bromides with glycerophosphates is often successful. This may be conveniently administered according to the following formula :—

℞	Sodii Sulphocarbolat. - - - -	ʒ ij.
	Potass. Bromidi - - - - -	ʒ iij.
	Syr. Glycerophosph. Co. - - - -	℥ iss.
	Aq. Cinnamomi - - - - - ad	℥ vj.

One tablespoonful, in water, three times a day, after meals.

In atonic cases, the following-on medicine should be somewhat different, because the general tone of the body is always poor, and requires all the help that can be given it from drugs likely to build it up. The following combination is generally efficacious :—

℞	Ferri Redacti - - - - - -	gr. iii.
	β-Naphthol - - - - - -	gr. iii.
	Strychninæ - - - - - -	gr. $\frac{1}{40}$
	Codeinæ - - - - - - -	gr. $\frac{1}{4}$.
	Pil. Asafœtid. Co. - - - - -	gr. ii.
	Ft. Capsul.	

One to be taken three times a day after meals.

After these capsules have been taken for such a time as seems necessary, they may be succeeded by a more potent form of iron, and, as a rule, no more satisfactory mixture will be found than the old mistura ferri aperiens, which should be taken in periods of three weeks' duration, with one week's interval, until convalescence is completely restored.

In patients with a rheumatic family history, 10 grains of acetyl-salicylic acid, taken at bedtime, will help to counteract the inherited tendencies, and to promote sleep. In other cases, in which insomnia is a predominating experience, 7 grains of medinal, or 10 grains of chloretone, or 20 grains of chloralamide, taken for three or four nights in succession, and preferably swallowed with a tablespoonful of brandy or whisky in hot water, will often restore a satisfactory habit of sleep.

◆

THE DIETETIC TREATMENT OF DIABETES MELLITUS.

By R. T. WILLIAMSON, M.D., F.R.C.P.

Consulting Physician to the Royal Infirmary, Manchester.

The following are three special forms of dietetic treatment, which I have found most useful in cases of diabetes mellitus. Diet C. I have used frequently for four years, diets A. and B. for shorter periods, with much success; and I think others will find them of service. These special diets are unsuitable in cases of diabetes in which certain severe complications have occurred, and are often unsuitable in some cases of severe diabetes with persistent perchloride of iron reaction in the urine (diacetic acid reaction, acidosis); although, in certain of these cases, they are sometimes of distinct service. Excluding these cases of persistent acidosis and cases with certain severe complications, both of which require special consideration, the following is a line of treatment which I have found of much service in many cases.

If the glycosuria continues after the patient has been placed for a few days on a restricted diabetic diet plus three ounces of white bread daily, then a rigid diabetic diet is tried, the white bread being cut off entirely and replaced by a suitable diabetic bread. If this fails to check the glycosuria after a very short period, the following diets may be tried, in any order, and in succession, if necessary. Diet A. is often very useful, and often checks the glycosuria in a few days.

For one week, the patient takes only the following foods, and rests on the sofa all day :—

DIET A.—VEGETABLES AND JELLY.

Breakfast, 8 *a.m.*—Coffee or tea with cream or milk. Tomatoes, mushrooms, or onions, lettuce, jelly.

11 *a.m.*—Jelly.

Dinner, 1 *p.m.*—Tomato soup. One or two of the following: vegetable marrow, onions, cabbage, cauliflower, curly green, asparagus, French beans, boiled lettuce, spinach, Brussels sprouts, cucumber, mushrooms. Jelly.

3.30 *p.m.*—Jelly.

Tea, 5 p.m.—Tea with cream or milk. One or two of the following: tomatoes, onions, lettuce, cucumber, salad, mushrooms. Jelly.

Supper.—Jelly.

The jellies suitable are: veal jelly, beef-tea jelly, calf's-foot jelly, lemon jelly.

If the glycosuria still continues after this diet has been followed for seven days, an ordinary diabetic diet is allowed for a few days or a week, and then the following diet is tried for seven days—diet B.—the patient resting on the sofa all day:—

DIET B.—EGGS, MILK, CREAM, ETC.

8 *a.m.*—Coffee or tea, with one tablespoonful of cream. One egg (poached, boiled or buttered).

10 *a.m.*—A glass of warm milk (half a pint).

12 *noon.*—Custard (prepared from one egg and half a pint of milk).

2 *p.m.*—A glass of warm milk (half a pint).

4 *p.m.*—Tea, with one tablespoonful of cream. One egg (poached boiled or buttered).

6 *p.m.*—Cream, two tablespoonfuls, in half a pint of warm beef-tea.

8 *p.m.*—A glass of warm milk, or one egg beaten up and added to half a pint of warm beef-tea.

10 *p.m.*—Cream, two tablespoonfuls, in half a pint of warm beef-tea.

This diet is often very useful, and may check the glycosuria promptly in a few days. If it fails, the patient is placed on the ordinary diabetic diet for a few days, and then the following casein diet is tried for seven days, the patient resting on the sofa all day:—

DIET C.—CASEIN AND CREAM.[1]

The patient is given, for seven or ten days only, a glass of casein (or biogene) and cream with water every two hours from 8 a.m. to 10 p.m. The casein

---

[1] *See also* writer's article in *B.M.J.*, March 13, 1915.

> preparation, lait-proto No. 6, will probably be the most satisfactory for the majority of patients. A cup of tea or beef-tea, or both, may be also taken, if the patient desires, twice a day.
>
> The mixture of casein and cream and water is prepared as follows:—One tablespoonful of casein, or lait-proto No. 6, one tablespoonful of cream; mix well in a tumbler with a fork or spoon, then add hot water (or cold, if preferred) very gradually, mixing well until the tumbler is full. (The fluid may be sweetened with saccharin, or flavoured with nutmeg, if desired, or by the addition of a tablespoonful of whisky or sherry.)

[Lait-proto No. 6 can be obtained from Casein, Ltd., Culvert Works, Sheepcote Lane, Battersea, S.W. 11.]

(In place of *one* tablespoonful of casein, *two* tablespoonfuls of biogene may be used, if the patient does not like the taste of the casein. It should be mixed with *two* tablespoonfuls of cream and the water added as just described.)

Many patients take the casein or biogene quite well, others find both unpalatable, and some cannot take either. Lait-proto No. 6 may be taken quite well when ordinary casein or biogene cannot be taken.

If the casein treatment fails to check the glycosuria by the fifth or sixth day, it is well to diminish the amount of casein to half the quantity. This often succeeds when casein, in the quantity just mentioned, has failed to check the glycosuria.

If we wish to avoid using diabetic breads, diet A., B. or C. may be tried at once, if a diabetic diet, plus two or three ounces of white bread *daily*, fails to check the glycosuria. These diets A., B. and C. should be carefully observed; if they cause sickness, severe constipation, diarrhœa, or unpleasant symptoms, or if the patient feels very weak whilst taking them, they should be at once discontinued: but most patients take them quite well. Diet C. requires to be the most carefully observed.

These three diets are often of great service in checking the glycosuria promptly, but should be continued only for a limited period. I seldom continue them longer than seven days. They often check the glycosuria in from three to seven days, occasionally in one or two days. They may be tried in any order. One may answer when the others fail. Thus often both the diet B. (milk, eggs, beef tea, etc.) and the casein diet C. have failed to check the glycosuria, but the diet A. (of vegetables and jelly) has been successful. When diet B. (milk, eggs, beef-tea) and diet A. (vegetables and jelly) have failed, the casein diet C. has been successful.

Some patients, especially those who like to take large quantities of food, prefer the diet A. of vegetables and jelly, others the milk and egg and beef-tea diet, B., others the casein and cream diet, C. The last-named diet is to many patients the least palatable, but I have found it successful a little more frequently than the other two.

TREATMENT D.—FASTING.

If all the diets just described fail to check the glycosuria, then, after the patient has been allowed to return for a few days to the ordinary diabetic diet first described in this article, *complete fasting* may be tried. It may check the glycosuria for a day or two or for a long period, when the other diets have failed; but very frequently, if the other diets, A., B. and C., have failed, fasting only checks the glycosuria for a day or two or for a few days, and any increase in food is at once followed by glycosuria.

During this period of fasting, the patient takes only the following for a period of one, two, three or four days:—

Coffee, with cream, three times a day.
Tea, with cream, three times a day.
Beef-tea three times a day.
Whisky and soda twice a day.
Water, as desired.

The coffee, tea, and beef-tea may be taken more frequently if desired.

If the glycosuria is checked, a very gradual return to ordinary diabetic diet follows.

The treatment by fasting, or alimentary rest in various forms, has recently been described in most medical journals, so that in this article the treatment need not be described again. Apart from the more prolonged fasting, periodic fast days were recommended long ago by continental physicians, especially in Germany by Naunyn and others.

Fast days, once a week, are sometimes of service. On these days the patient fasts and takes only tea or coffee, beef-tea or whisky and soda several times, and no other food. In the less severe cases the glycosuria ceases on these days, but it often returns in a day or two. It may, however, not return for many days, and occasionally for a considerable time it is much less than before the fast days; but often I have found the results of little permanent value. A fast day once a week is useful in some cases, but I much prefer the treatment with the diets A., B. or C. described in this article. I also prefer these diets to the more prolonged fasting which is now being carried out so frequently.

After the glycosuria has been checked by the diet A., B. or C., the diet is *very gradually* changed. Bacon, green vegetables, eggs are added *gradually* (if the patient is not already taking these), and other articles of diet in diet A., B. or C. discontinued. Later two or three ponos biscuits or other suitable diabetic bread or biscuits are allowed in small quantity. In course of time, the diet first described in this article (ordinary diabetic diet with or without two or three ounces of white bread daily) is reached.

If the glycosuria returns after an ordinary diabetic diet has been taken for some time, it is well to place the patient back again on one of the diets, A., B. or C., for a few days. This often checks the glycosuria, and then the patient may return again to the ordinary diabetic diet.

A useful course is to advise one of the diets, A., B. or C. for *one or two days at the week end*, every week, and during the rest of the week to allow the ordinary diabetic diet.

All of these diets often fail in very severe cases, and they sometimes fail to remove the glycosuria even in cases which at first appear to be of only medium severity; but when the patient returns to an ordinary diabetic diet, *occasionally* the glycosuria then ceases, and for a long time the urine may be free from sugar.

This diet may check the glycosuria in a day or two or in a few days.

Salicylate of soda and acetyl-salicylic acid[1] are often both of service, and I have been able to demonstrate their value clearly, when given in sufficiently large doses. Salicylate of quinine also appears to be of service in some cases, and these drugs are worthy of careful trial if dietetic treatment fails. In some cases, all the treatments here described fail to check the glycosuria, and we have then to be content to reduce it to as small a quantity as possible by an ordinary diabetic diet plus a small amount of white bread (two or three ounces daily), with or without a small quantity of milk daily; but the diets just described, A., B. and C., are often of very great service in removing the glycosuria temporarily. They very often remove the glycosuria when an ordinary rigid diabetic diet has failed, and the glycosuria may then cease for a long period, even if it returns later. If the sugar should return in the urine, by repeating the diet A., B. or C. for a short time—for a few days or a week—the glycosuria may again be checked. In some cases it may be checked repeatedly in this way for a long time. For months or years, in *some cases*, the urine may in this way be kept free from sugar, and the patient may be able to follow his work and live happily with an ordinary restricted, but not very rigid, diabetic diet.

---

[1] *See* writer's articles in THE PRACTITIONER, July, 1907. *British Med. Journ.*, March 30, 1901, and December 27, 1902. *Medical Chron.*, May, 1906.

◆

VENEREAL DISEASES AS WE SEE THEM TO-DAY.

BY J. E. R. McDONAGH, F.R.C.S.

Surgeon, London Lock Hospital, etc.

INTRODUCTION.

OWING to the vague knowledge existing of my theory of oxidation and reduction, and being myself more than ever convinced of its utility as applied to the treatment of infective diseases, I will attempt to put it here, in my annual article for readers of THE PRACTITIONER, in the simplest language possible. I will trace step by step how I came to hold that the body attacks its parasites by oxidation and reduction, and that drugs stimulate and accelerate these reactions.

STAINING.

When I had brought out my work on the "Leucocytozoon syphilidis," and showed that the spirochæta pallida was not the one and only phase of the organism which caused syphilis, I set to work to prove that the cells, which I took to be parasites, were not the products of degeneration of the host's cells.

When the phases of the syphilitic organism were stained alive with borax-methylene-blue, some of the phases stained blue and others pink. Borax-methylene-blue is a mixture of methylene violet, a basic dye, and methylene red, an acid dye. It is held, rightly, that basic dyes show an affinity for acid structures, and acid dyes for basic structures; therefore, the phases which stain with methylene red should be basic, and not take on a basic dye. When the syphilitic organism is stained in section with pyronin and methyl green, all the phases stain with pyronin and none with methyl green. Both pyronin and methyl green are basic dyes, the former more so than the latter. As those phases, which stain alive with methylene red, show the greatest affinity for pyronin, it is at once clear that another factor, besides the simple one of acid and basic, must enter into the theory of staining. Methyl green and methylene violet are decolourized by reducing agents, the former more readily than the latter. Pyronin is decolourized by oxidizing agents, and both methyl green and pyronin show an affinity for the agent which decolourizes the other.

I must now explain the oxidizing and reducing actions of the protein colloidal particles. The action of oxidation is performed by a ferment called an oxidase. An oxidase, which is a protein compound of iron, in the presence of water and a peroxide will form active oxygen. The following formula, though only diagrammatic, will show what happens :—

$$\underset{\text{(oxidase)}}{R.Fe(OH)_2} + \underset{\text{(peroxide)}}{HO.OH} + \underset{\text{(water)}}{H.OH} = R.Fe(OH)_3 + H_2O + \underset{\text{(active oxygen).}}{OH}$$

The active oxygen is probably in the form of hydroxyl (OH). The peroxide, the necessary medium for the oxidase to work upon, is formed by a ferment called a reductase. A reductase, which is a protein compound of sulphur, in the presence of water forms peroxide and active hydrogen. The following formula, though only diagrammatic, will show what happens :—

$$\underset{\text{(reductase)}}{R.S.S.R} + \underset{\text{(water)}}{2H.OH} = \underset{\substack{\text{(sulphur}\\\text{protein)}}}{R.S} + \underset{\substack{\text{(mercaptan}\\\text{protein)}}}{R.SH} + \underset{\text{(peroxide)}}{HO.OH} + \underset{\substack{\text{(active}\\\text{hydrogen)}}}{H}$$

The peroxide is not H_2O_2 as it is usually known, but some modification of hydroxyl (OH). Therefore, the protein colloidal particles possess two kinds of hydroxyl groups, both of which are acid, since they possess a negative charge, of which only one has the power of oxidation. It is the active oxygen, or the oxidizing hydroxyl group, which shows an affinity for methyl green and decolourizes pyronin, while it is the active hydrogen group which decolourizes methyl green and methylene violet. As the hydrogen ion can show no affinity for pyronin, since they both have the same charge, it is reasonable to assume that it is the hydroxyl group in the form of the peroxide which shows the affinity for pyronin. This is shown to be the case, because any agent which will increase the amount of peroxide or destroy the active oxygen will cause the substance to stain more deeply with pyronin (*vide:* mordanting with hydroquinone instead of resorcinol).

As the peroxide has a negative charge, it cannot stain with methylene red, an acid dye; therefore, as the active hydrogen group is the only group under consideration which bears a positive charge, it must be this group that shows the affinity for methylene red, which some of the phases exhibit when stained *in vivo* with borax-methylene-blue. Staining, then, is a surface action depending upon the hydroxyl (OH) and hydrogen (H) components of the substance stained. Further, it is an action, which depends upon the electric charge, and the anomalies of which can be explained by oxidation and reduction, two actions regulated by iron and sulphur respectively.

As the spirochæta pallida is the phase showing the greatest affinity for methylene red, more so than any other spirochæta I have examined, it suggests that it is the phase which exhibits the greatest reducing action on its surface. This is proved by the readiness with which it stains with silver nitrate, and the strong reducing action of all the phases explains why they should be optically active when viewed through a Nicol's prism. What we see, then, is that parasites stain with pyronin, protozoa more readily than bacteria, and that it is the most active phase in the life-history of a protozoon which has the greatest reducing action. When we examine the host cells, we find that it is the most active and the most important part of the cell which exhibits the greatest affinity for pyronin, namely, the nucleolus. Carrying the matter still further, I found that the nucleolus was made up of nuclein, the part which stains with methyl green, and protoplasm, which has strong reducing properties and stains with pyronin. The parasitic phases will also, under certain conditions, stain with methyl green, which proves that they contain nuclein as well. I am of opinion that cancer is nothing more nor less than nucleolar activity of the host's cells, a condition in which, owing to a physical alteration of the colloidal particles of the nucleolus, this structure behaves as a cell, or, in other words, as a parasite.

An interesting point to mention here is that the protoplasm of plasma cells is made up of a number of colloidal particles, which only differ from those in the serum by being enclosed in a fixed area. Treatment breaks up these particles and lets them loose, in which form they are most advantageously placed to attack the parasites locally.

RATIONALE OF THE WASSERMANN REACTION AND GEL TEST.

My next research was conducted with the view of discovering the rationale of the Wassermann reaction, which I found to be purely a physical reaction depending upon the size and number of the colloidal particles in the serum. The serum contains protein, most of which is in the form of colloidal particles, a fact which can quickly be verified with the ultramicroscope. Under the ultramicroscope, the particles give much the same appearance as dust caught in the sun's rays penetrating a portion of a darkened room; in other words, they give a Tyndall cone and exhibit Brownian movement, because, not being in true solution, they are able individually to difract light. Ultramicroscopic examination shows that, in syphilis, the colloidal particles are larger and more numerous than in other diseases; that in late syphilis the change is one of size rather than of number, and that treatment reduces the size, but increases the number. These colloidal particles form the antibody, and their action on the surface of the parasites vanquishes the latter. Being colloidal particles they will have a surface, therefore the laws of permeability will apply to them as to parasites. On the surface are salts, or ions as they are called, which regulate the permeability as well as the oxidizing and reducing actions which these particles exhibit.

If the particles are deprived of their salts, they increase in size and become precipitated, in which state it would be impossible for the blood to circulate; therefore, it is necessary that they should retain a constant form. This can only be done provided other salts are available to replace those lost, and this is the reason why the fluid part of serum contains salts in solution. The two sets of salts balance, and this balance is maintained by what is known as the normal hydrogen ion concentration. The principle ions are the hydroxyl and hydrogen ions—acid and basic ions. The hydroxyl ions are in excess of the hydrogen ions, and in consequence serum is on the alkaline side of neutrality. If the serum is made more acid or more alkaline than normal, the colloidal particles will give up some of their salts, increase in size, and be ever ready to regain their normal state when counteracting salts are available. Heating a serum will deprive the particles of some of their salts, so will alternate freezing and thawing, altering the atmospheric pressure at which a serum is kept, etc. So far as test tube experiments go, an upset of the hydrogen ion concentration can be demonstrated in many ways, and that frequently employed is the well-known phenomenon of hæmolysis.

In hæmolysis, there are three factors: (1) antigen, the red blood-corpuscles; (2) amboceptor, the serum of a rabbit immunized against the red blood-corpuscles; (3) complement, the fresh serum of a guinea-pig. When these three are mixed in definite proportions, owing to an upset of the normal hydrogen ion concentration, the red blood-corpuscles become robbed of some of their salts, which alters their permeability and allows the hæmoglobin to come out into the mixture. The corpuscles lose some of their salts because the amboceptor is heated before use, and, therefore, when the amboceptor particles meet perfect colloidal particles, such as those of the blood-corpuscles and in the guinea-pig's serum, they get themselves back into their normal colloidal state at the expense of the perfect colloidal particles. Another factor enters here, which is that the amboceptor is specific. All surface actions are much more definitive when the colloidal particles are specific, and specificity depends in part upon the amino groups, the presence of which modifies the character of the colloid, but it is not known exactly how the amino groups work.

The term given to a colloid, like protein, with amino groups is "emulsoid," while a simple colloid, like aluminium hydroxide ($Al(OH)_3$), is called "suspensoid," and the great distinction between these two is that the latter is and the former is not precipitated by salts in weak solution. As a suspensoid colloid will rob an emulsoid of some of its salts without the intervention of specificity, it struck me that a suspensoid colloid could be used in an hæmolytic system instead of a specific amboceptor. I soon found that aluminium hydroxide would take the place of the immunized rabbit's serum. Aluminium hydroxide makes the blood more acid, because it increases the hydrogen ion concentration, and when adsorbed the metallic ion ($Al^{\cdot\cdot\cdot}$) takes up three hydroxyl (OH) molecules, being trivalent, and this leaves an excess of hydrogen ($H^{\cdot}$) ions. Silicic acid will also take the place of amboceptor. Silicic acid makes the blood more basic, because the silicon ion has the opposite charge to aluminium; therefore, the surface action is one of charge and one dependent upon reaction, a fact which brings the phenomenon of hæmolysis into line with that of staining.

The first part of the Wassermann reaction is made up of three factors, and the action between them is exactly similar to that which takes place in the hæmolytic system. The first factor is antigen, which is an emulsion of colloidal particles, which in part have the properties of suspensoids. The protein particles in a syphilitic serum, owing to their immense number and increase in size, which tend to make them less fully ionized than the protein particles in a normal serum, will readily seize upon the salts of fully charged protein particles (complement). As the action of antigen approaches that of aluminium hydroxide, being partly suspensoid, the combined action of the two will upset the normal hydrogen concentration and destroy complement. It follows from this that complement is nothing more nor less than the normal hydrogen ion concentration, or, in other words, the standard alkalinity of the serum. Therefore, complement is not a concrete substance, and the name should disappear. The particles in a normal serum can be rendered less emulsoid and more suspensoid by heating, etc. If this change is brought about, the serum will give a positive Wassermann reaction. As there are so many factors at work to modify the Wassermann reaction, one can only say, that a positive reaction means that the patient has had syphilis, not that he is syphilitic at the time the reaction is positive, nor that he necessarily requires treatment.

If glacial acetic acid is added to serum, it rids the colloidal particles of the water they contain, and allows them to be precipitated readily by salts, such as the nitrates or sulphates of thorium and lanthanum. As the deprivation of water will be regulated both by the size and number of the particles, the rapidity with which precipitation occurs will also vary. To this test I have given the name of "Gel Test." The particles most readily precipitated are those from the serum of patients who have been treated, next those from the serum of patients in the early stages of syphilis, then those from the serum of normal patients, and then those from the serum of patients in the late stages of syphilis. Frequently, the particles of the serum from the late cases of syphilis are precipitated more quickly than from normal cases, and when this is the case the oxidizing action of the particles is more to the fore than the reducing action. The particles having the largest size occur in late syphilis, and they also have the strongest reducing action; consequently, in such cases, reducing chemotherapeutic agents should be employed before oxidizing chemotherapeutic agents.

The introduction of chemotherapeutic drugs breaks up the particles into several smaller ones. Oxidizing drugs are most powerful in this respect when the particles are small, and reducing drugs when the particles are large. Therefore, the "Gel Test" is useful in differentiating one case of syphilis from another, but it will not in its present form serve to distinguish all syphilitic sera from sera of other diseases, because the particles of the serum of patients with acute bacterial diseases may be more quickly precipitated than they are in treated cases of syphilis. A serum withdrawn directly after a heavy meal may give a positive reaction, due to the influence the fats have upon surface tension.

As treatment breaks up the colloidal particles and, if continued too long, sends many of them into solution, with the result that the patient's protective substance is depressed rather than increased, it can readily be understood, from what I have just stated, that great care is necessary in choosing the right dose of the oxidizing agent employed in acute bacterial infections. This point is so important that I will dwell upon it later.

THE RATIONALE OF SHOCK OR ANAPHYLAXIS.

My researches on the Wassermann reaction enabled me to unravel the mysteries of anaphylaxis or shock, but as my article on this subject was published in this journal so recently (July, 1917), there is no necessity for me to do more than touch upon the points which are relevant to what I want now to explain.

Shock is merely a partial or complete destruction of complements *in corpore*, in other words, an upset of the normal hydrogen ion concentration. Since the hydrogen ion concentration can only be upset by increasing either the hydrogen or the hydroxyl ion concentration, or, in other words, by rendering the serum more acid or more alkaline than normal, shock can always be avoided or cured by injecting a substance possessing the opposite charge to that which produces the shock.

For instance, aluminium hydroxide increases the hydrogen ion concentration, and rapidly kills rabbits if injected intravenously. Silicic acid increases the hydroxyl ion concentration, and is equally fatal; but if both are injected simultaneously, the rabbit undergoes no inconvenience. Shock or poisoning following arsenic, mercury, or lead, all metals which increase the hydrogen ion concentration, can readily be counter-balanced by intramine (di-ortho-amino-thio-benzene), a drug containing sulphur—a metalloid which increases the hydroxyl ion concentration. Indeed, salvarsan and mercury may always be prevented from exhibiting toxic manifestations by using them alternately with intramine.

I will now cite some interesting cases to bear this out :—

CASE 1.—The patient had a primary sore on the skin of the penis, general adenitis, and was more or less covered with a follicular syphilitic eruption. I injected intravenously 10 c.c. of a 5 per cent. emulsion of colloidal mercury. In the quantity injected there was 0·5 gramme of colloidal mercury, the action of which would be very much greater than 0·5 gramme of ordinary mercury. On the following day, the patient had severe abdominal pain and diarrhœa. The diarrhœa increased, and blood was passed *per rectum*. This continued for a week, during which time not a drop of urine was passed. On the second day severe stomatitis set in, which became gangrenous a few days later. The patient also had hæmorrhagic conjunctivitis, herpes oris, looked and was desperately ill, and I had fears that he might die. This was a typical case of acute mercurial poisoning, and the mercury was acting as a poison in virtue of its oxidizing power. This being the case, it struck me that the administration of an equally powerful reducing agent might cure the condition. I injected 100·0 c.c. of colloidal iodine intravenously, and 5 c.c. of intramine intramuscularly. Within 48 hours the diarrhœa ceased, and the patient passed nearly his full amount of urine. The condition improved so much from day to day that, with no other treatment whatever, he was perfectly well

18 days later, when there was no albumen in the urine and every syphilitic symptom had vanished.

Another patient received 10 cc. of the same preparation intravenously the same day, having already had 10 cc. injected intramuscularly three days previously. Therefore, the patient had 1 gramme of colloidal mercury in his system. This patient had exactly the same symptoms as already described, and recovered in the same rapid way after an intravenous injection of colloidal iodine, and an intramuscular injection of intramine. I have had three other cases in which the symptoms were not so pronounced, smaller doses having been prescribed, but which improved at once with one injection of intramine. In all these five cases, the syphilitic manifestations disappeared in a few days, and some of the lesions were such as would not have vanished with six or more injections of salvarsan. The urine in these cases has been tested several times since, and has always been free from albumen.

Case 2.—A woman, suffering from cerebro-spinal syphilis, had six injections of galyl, three being intraspinal, and then was given mercury internally for nine months. The last galyl injection produced an arsenical dermatitis which, in spite of treatment, persisted for nine months, when the cerebro-spinal symptoms reappeared. Within three days after an intravenous injection of colloidal iodine and an intramuscular injection of intramine, the dermatitis had practically vanished.

Case 3.—This patient had syphilis for which he received seven injections of "606" and seven injections of mercury in May. In August of the same year, he was circumcised under chloroform anæsthesia. A few days later, an eruption appeared on the hands, like cheiro-pompholyx, and quickly spread all over the body, when it assumed the appearance of an acute seborrhœic eczema. The eruption became very severe and typical of arsenical dermatitis. In September, the patient had one intravenous injection of colloidal iodine (100 cc.) and two intravenous injections of intramine (100 cc.) at two days' interval between each. Within a few hours after the first injection the patient said his skin felt better, and particularly remarked upon the improvement after the intramine. Under local treatment by the end of the month the eruption had completely disappeared, and the patient was able to leave hospital with his skin perfectly clear, with no loss of hair and no pigmentation.

The last case is the only one out of 39 cases of severe arsenical dermatitis that I have seen, which I was able to say completely recovered.

Of the 39 cases above referred to, 11 died as a direct result of the arsenic, the rest were under treatment for their skin condition from six to eighteen months, and even when released from treatment they had alopecia or arsenical pigmentation, or both.

This case presents more than the usual interest, because the onset of the dermatitis was delayed, which is not infrequently the case; because it occurred after the patient had had chloroform, a drug which, like arsenic when it acts as a toxic agent, increases the hydrogen ion concentration; and because the eruption began as a cheiro-pompholyx. Many severe toxic dermatoses begin with tiny vesicles on the hands, and one of the best known now is the delayed eruption which follows the mustard gas; therefore, it is certain that the so-called dysidrosis is not a disease of the sweat glands at all, but a dermatitis caused by agents which make the blood too acid or too alkaline.

Arsenic makes the blood too acid, and mustard gas, which is di-phenyl-ethyl sulphide, makes it too alkaline. Therefore, as it is again a case of metal and metalloid, I determined to try injecting a metal into a severe case of mustard gas poisoning with the following result:—

CASE 4.—The patient developed, 14 days after being gassed, an acute eruption on the hands, axillæ, and groins, which soon spread over the rest of his body. After being treated for two months in hospital he was discharged uncured, but distinctly improved. A fortnight later the rash reappeared with greater severity, when he came under my care. I treated the condition locally with cold-starch poultices, and injected intramuscularly 2 cc. of a 5 per cent. emulsion of colloidal mercury, with the result that in a week the rash had vanished.

On another occasion, I had given two patients an overdose of intramine intravenously, 20 cc. of a 1 per cent. emulsion, with the result that they ran a high temperature, sweated profusely, complained of violent headaches, and had vomiting and diarrhœa. One of the patients had excruciating neuritis over the deltoid region of the right arm. Guided by the experience I had had with intramine curing mercurialism, on the third day, as the symptoms had not abated, I injected colloidal mercury intravenously, with the result that the patients' condition became normal on the very day that the oxidizing agent was injected.

Prevention is better than cure, so let me lay emphasis on the fact that a case of arsenical dermatitis would never be seen if intramine was admitted into treatment as a routine. A very large number of cases of arsenical dermatitis are occurring, which are never published. A certain percentage of these die, usually of broncho-pneumonia, under which heading they are categorized to avoid detection.

If the prevailing charge of a shock-producing substance is unknown, and as shock can be prevented and temporarily checked by increasing the stability of the permeability of the colloidal protein particles, which is mainly regulated by calcium, I have introduced 10 cc. ampoules containing calcium chloride 5 per cent.,—glucose 15 per cent., and gelatin 3 per cent. Each ampoule should be melted, the contents diluted to 50 or 100 cc. with water, and then injected intravenously. After such an injection a shock-producing drug will not produce shock, and if shock has been produced, it can temporarily be checked by an injection.

Certain forms of asthma, urticaria, etc., are symptoms of shock, and in such cases I have been successful in affording the patient relief by an intravenous injection of the calcium chloride mixture.

Anaphylaxis or shock is then, like staining and the Wassermann reaction, a surface action regulated by the hydrogen and hydroxyl ions of the colloidal protein particles.

RATIONALE OF CHEMOTHERAPY, AND OF THE ACTION OF ANTISEPTICS.

When I had unravelled the *modus operandi* of the Wassermann reaction, it at once became clear that Ehrlich's conception of chemotherapy was untenable. In the first place, it is impossible for a drug to be parasito-tropic without being organo-tropic, because a drug when injected into the body does not exhibit its action until it has been taken up by the colloidal protein particles in the serum. Indeed, the organo-tropic properties of a drug are all important, because the rapidity and the degree with which it is taken up are dependent upon the chemico-physical molecular configuration of that drug, and it is the action of the collodial protein particles which the drug, when adsorbed, accelerates and stimulates.

What applies to a drug applies to an antiseptic. As far as I know, no drug has a specific action on any organism, but, by means of a surface action, it increases the activity of the protective substance of the host. Similarly with antiseptics, if one of them kills bacteria directly, it will harm the cells of the host; whereas the ideal antiseptic is one which will stimulate and accelerate the protective substance of the host without doing any damage, but none has yet been found. Trypoflavine, a much patented German drug, has been vaunted largely in England as an ideal antiseptic. The action of trypoflavine is due to its large molecular weight and to its important amino-groups. The action of salvarsan is due to its being a large molecule, to its having amino-groups, and arsenic, which merely acts as an oxidizing agent. The action of mercury is also due to its high molecular weight. There is nothing specific about the action of these drugs, and others similarly active could easily be manufactured with care and without infringing any patent rights.

I cannot help thinking that an acridine body with a metal, and another with a metalloid, would prove to be far more valuable as antiseptics than the plain acridine compound, trypoflavine. When I found that iron was the normal oxidizing agent *in corpore*, and that the action of ferrivine was not in all cases so powerful as that of salvarsan, owing to the fact that the iron is not so firmly bound to the benzene nucleus as the arsenic is in salvarsan, I made several attempts to prepare more satisfactory compounds, and was successful in discovering some iron acridine bodies which had a considerable effect in aiding the protein particles to overcome protozoal infections in animals. Unfortunately, the drugs proved too toxic, for the animals died in from 7 to 21 days later of aniline poisoning, owing to the fact that the drugs break down too readily at the acridine ring. This may possibly be the reason why trypoflavine has not fulfilled its expectations, and this difficulty could doubtless be quickly surmounted.

SUMMARY OF ACTIONS DESCRIBED.

I will now draw certain analogies between the subjects discussed to make my points clearer still. The most active stains are those which have large molecules and amino-groups in their molecules, because molecular weight and the presence of amino-groups increase their adsorptive power—a surface action regulated by the hydrogen and hydroxyl ions (basic and acid ions), and by oxidation and reduction.

Anaphylaxis caused by proteins, which are emulsoid colloids, is dependent upon the amino-groups of the particles, since any interference with these groups diminishes the toxicity of the protein producing anaphylaxis.

A specific amboceptor in the hæmolytic system acts in the same way as a protein producing anaphylaxis.

As a suspensoid colloid will take the place of the amboceptor in the hæmolytic system, so will it produce shock. The compound of arsenic having the greatest therapeutic action is that which has the largest molecule and free amino-groups, such as salvarsan, for the reasons stated above. If the amino-groups are destroyed in any way, the therapeutic action is diminished and this is the reason why neo-salvarsan is not so potent as salvarsan.

The activity of a drug, therefore, depends upon its molecular weight and its amino-groups, and those drugs are most potent which have the amino-groups in the ortho position to the element; it is for this reason that intramine is so active therapeutically.

A drug, then, with amino-groups approaches the amboceptor in a hæmolytic system and a protein producing anaphylaxis.

If a specific amboceptor and a specific protein can be replaced, ought not a drug in the colloidal state without amino-groups to be as active as one with amino-groups?

The negative answer to this is, because the injection of such a drug immediately causes shock, to avoid which it has to be protected beforehand, and the protection giving the suspensoid colloid an emulsoid coating prevents it from fully exercising its action.

That this is true is readily seen, when I state that aluminium hydroxide, protected with any amino-compound, will not act as an amboceptor in the hæmolytic system, nor cause shock.

It follows from this that colloidal sulphur can no more replace intramine than colloidal arsenic can replace salvarsan. My opponents have suddenly woken up to the value of sulphur, and have even gone so far as to use colloidal sulphur in cases of arsenical dermatitis, but probably do not quite realize the facts above enunciated.

In the same hospital, in which the only severe case of arsenical dermatitis discharged cured was treated with intramine, another case was treated with colloidal sulphur with no improvement. A statement of this sort requires no comment, except to emphasize the fact that it is unfair to let these cases suffer as they do, and even lose their lives, when a drug (intramine) is available which will cure them.

The destruction of parasites is merely a surface action between them and the protein colloidal particles, a surface action of neutralization, or, in other words, an effort on the part of the protein particles in the serum to deprive the parasites of the oxygen necessary for their existence.

The action of the protein particles will naturally be regulated by their oxidizing power, hence arises the value of increasing the oxidizing power of the particles by means of oxidizing agents directly and reducing agents indirectly. The oxidizing action of the protein particles will naturally be diminished if the serum is made more acid than normal, or, in other words, if the hydrogen ion concentration is raised. Alcohol has this action, and this is the reason why venereal diseases, for instance, are more readily contracted by patients under its influence.

From what I have said, the reader will see that it is very important to know when to use oxidizing and when reducing agents, and in what doses the drugs should be employed. The constitution of no two individuals is the same, and only experience, which cannot be put into words on paper, will give one the necessary information. Although treatment of disease is very much more uniform, simple, and more rational than it has ever been, facts which have been the cause, I am sorry to say, of the severe criticism with which my work has been received, it has become very much more individual, which is better both for patient and doctor.

In syphilis, owing to the fact that it is practically impossible to give a single dose of a drug which will be more than sufficient for the protein particles in the serum to take up, owing to their increased number and size in this disease, no harm can be done by giving a reducing agent when an oxidizing one should be employed, for the mistake can be so quickly verified. There is also not the fear of giving an overdose at a single injection. The only fear is of giving too many injections of an oxidizing agent, an error which can always be avoided.

In bacterial diseases, there is not so much the fear of injecting an oxidizing agent, when a reducing agent should be used, as I will presently explain, but there is a very grave fear of giving overdoses of the oxidizing agent because of the paucity, so to speak, of the specific protein colloidal particles.

Experience has taught me that reducing agents, such as intramine, etc., can be employed with safety in any dose, but with oxidizing agents this is not the case.

Oxidizing agents send many of the colloidal particles into solution, in which form they have no protective action, so that, when there is not an abundance of them, it can readily be understood how an overdose might make the patient worse, which is actually the case.

OXIDIZING AND REDUCING DRUGS NOW IN USE IN VENEREAL DISEASES.

I must now mention how the oxidizing and reducing actions of the protein particles are completed, and how I came to use the oxidizing agents mentioned in the article. The oxidizing action is primarily dependent upon the presence of iron in the form of an hydroxide. Most metals, when injected into the body, will act catalytically as oxidases, but iron is the one which normally fulfils this part in the human body. In certain invertebrates, copper is the normal oxidase, while, in plants, manganese is the metal. The arsenic in salvarsan merely acts as an oxidase; it does not kill the parasites directly. The reason why salvarsan has such a powerful action, is owing to its molecular constitution. In virtue of its amino-groups, the drug is readily adsorbed, so that the arsenic is able to exert its action to the full; and the reason why salvarsan is more efficacious in syphilis than in other diseases, is owing to the fact that there are more protein colloidal particles in the serum to which the salvarsan molecules can become adsorbed. Adsorption is also greater the higher the molecular weight of the substance injected, and this is the reason why mercury is so efficacious in syphilis.

Since neither arsenic nor mercury are normal constituents of the human body, and as iron is the natural oxidase, I have attempted to prepare an iron compound to take the place of two metals, which, however carefully they are used, are apt to cause toxic manifestations. Ferrivine (tri-para-amino-ferric sulphonate) is the best so far prepared, but unfortunately its action is not so powerful as salvarsan, because the iron is not directly attached to the benzene rings; consequently, only a minimum quantity can be taken up by the protein particles in the process of adsorption. The continued use of arsenic and mercury in syphilis is bad, since deleterious effects may be produced by prolonged administration of oxidizing agents only. This is why we see such severe recurrences after salvarsan, and so many cases of recurrences in the nervous system. The reaction of oxidation is dependent upon the presence of a peroxide, and the peroxide is formed in the reaction of reduction, which is also a catalytic reaction due to a ferment, called a reductase. The normal reductase in the body is a disulphide protein, and the introduction of intramine (di-ortho-amino-thio-benzene) into chemotherapy is based upon this. The action of intramine is extremely powerful, because the sulphur is firmly attached to the benzene nucleus, and the amino-groups are in the ortho position to it.

Speaking generally, intramine will not clear up syphilitic symptoms so quickly as salvarsan, for the simple reason that a reducing action is only subsidiary to an oxidizing action. This explains why intramine is shown to best advantage when employed with salvarsan, mercury, etc., inasmuch as it supplies the peroxide necessary for the oxidizing action of the metals. In certain chronic syphilitic lesions, such as gummatous glossitis, etc., in chronic bacterial infections, such as gonorrhœal rheumatism, and in cases of old-standing acne rosacea, seborrhœic eczema, etc., intramine will produce the result desired if employed alone, because the reducing action of the protein colloidal particles in such conditions comes more to the fore than the oxidizing action.

From what I have said, it is at once evident why intramine should be valuable in cases of arsenical and mercurial poisoning, plumbism, and applied locally to chronic ulcers, etc., which will not heal. Since I have combined intramine with "606" and mercury, which has been now for two years, I have never had a case of syphilis in which the recurrence was rapid or severe, or in which the nervous system was attacked. The action of iodine is similar to that of sulphur, but it is not nearly so efficacious. I generally use colloidal iodine with intramine when injected intravenously, because it prevents the mercaptan group, which results on the breaking down of intramine, from exhibiting its affinity for oxygen.

What the whole thing comes to is this, that no drug attacks organisms *in corpore* directly, but they merely stimulate and accelerate the normal oxidizing and reducing action of the protein particles in the serum, which are able to kill the parasites, because their stereo-chemical molecular configuration is as nearly homologous as possible to that of the protein particles of the parasites. The oxidizing and reducing actions are surface actions, whilst the other, which may be called the specific action, is one of the substratum; therefore, until we are able to synthesize drugs having stereo-chemical molecular configurations homologous to those of the protein particles, the action of which we desire to stimulate, we can do no more than increase the surface action.

I have noticed in patients suffering from syphilis, who are being treated with arsenic, that not infrequently boils develop for the first time or, if any are present, that they are aggravated. Many syphilitic patients, suffering from gonorrhœa as well, often have the discharge aggravated by much arsenical and mercurial treatment, but when small doses are employed the discharge is improved. I treated a series of cases of gonorrhœa with small doses of colloidal arsenic and colloidal mercury, but the results were not very satisfactory. I then employed colloidal copper and colloidal manganese with excellent results.

How I came to use copper and manganese was due to the following ideas. If evolution is correct, namely, that there is no hard-and-fast line between vegetable and animal life, and that animal life, from its simplest form to its most complex in the human form, has been by a process of progression from vegetable life, it is highly probable that metals have been evolved as well from one single element. I cannot help thinking that new unknown elements are now being formed from those of which we have full knowledge.

In plant life, manganese is the important element, whilst in invertebrates copper takes its place, and in human beings iron. Invertebrates are not so susceptible to bacterial infections as are human beings, and plants still less so. Possibly the copper and manganese are partly responsible for this increased protection, which was my reason for first using copper and then manganese. Copper in bacterial diseases, such as gonorrhœa and furunculosis, has a greater action than other metals in general use, for instance, iron, arsenic, and mercury, and the action of manganese far surpasses even that of copper. I have been struck by the fact, that, in syphilis, the employment of three oxidizing agents, such as iron, arsenic, and mercury, gives better results than three injections of any one of them. Therefore, I have wondered whether the combined use of copper and manganese would give better results than the use of manganese, but at present I am not in a position to make a definite statement on this point.

As the gonococcus is not such a simple organism as the staphylococcus, owing to the fact that it has an intracellular habitat, and in this respect resembles the animal parasites or protozoa, I did not expect the striking results with colloidal manganese in gonorrhœa, that I had obtained in furunculosis and other staphylococcic infections. My surmise was correct, so I then had to think how to surmount this difficulty. The metal which seems to exert the greatest influence on the lower protozoa, such as Leishmaniosis, to which, in my opinion, gonococci approach, is antimony; I, therefore, used colloidal antimony, in conjunction with colloidal manganese, with extremely good results.

SOME EFFECTS OF INTENSIVE ARSENICAL TREATMENT IN SYPHILIS.

So far as syphilis is concerned, I will now turn from theory to practice, and trace step by step how I have come to adopt my present scheme of treatment. When salvarsan first came in, it was injected subcutaneously and intramuscularly. Owing to the sloughing caused by the former method and the pain by the latter, the drug was injected intravenously.

Taking injection for injection, there is no doubt that a drug exerts a more powerful therapeutic effect when injected intramuscularly than when injected intravenously, because when injected directly into the blood-stream, some of it is excreted in the form injected and thus wasted. The part taken up has to be converted into the form in which it is used by the colloidal protein of the serum, the main function of which is to combat the parasites; consequently, energy is wasted, so to speak, at headquarters. When a drug is injected intramuscularly, practically none is excreted in the form injected, and it is converted at the base in the form in which it can at once be utilized by the main factor in the attack.

Recently, the introduction of salvarsan intramuscularly has come into vogue again in the army. This is probably owing to the fact that certain authorities feared that many accidents would occur if intravenous injections were universally employed. In private practice, the army routine is quite out of the question, for the pain caused is, in the majority of cases, unbearable. Furthermore, the induration left is often so pronounced, that it is impossible to give any further injections for some months. Although intramine causes pain, this is never intense, provided the injection has been made slightly alkaline before use, never lasts more than 48 hours, and leaves no induration behind. It is so difficult to understand why intramine, when only one or two injections have to be given, should be ruled out as being too painful, while six or more injections of salvarsan, which are far and away more painful, should be advised. Perhaps a patient should be prepared to bear pain caused by a German drug, and should only magnify it when an English drug is used.

As recurrences were the rule, when only one, two, or three injections of salvarsan were prescribed, and as the Wassermann reaction was at that time used to gauge the efficacy of a certain form of treatment, I conducted in 1911 a series of experiments to estimate how many injections of salvarsan were necessary to produce a negative reaction. In an article published in 1912, I showed that, at any rate in early syphilis, from 6 to 9 injections had to be employed to produce the desired effect. In spite of the opposition which such an apparently drastic measure met with, that method is to-day, six years later, adopted by those who then most strongly opposed it. For the next few years, I found that I saw many cases of what I considered to be reinfections, but at the same time I was also struck by the great increase of nervous syphilis. When later I discovered that the period at which the reinfection occurred coincided with that at which the nervous involvement became apparent, namely, from 8 to 12 weeks after the cessation of the course of salvarsan, I began to wonder whether what I considered to be reinfection was really a true reinfection or a recurrence. When I realized that the nervous recurrences were due to the use of too much arsenic and mercury, or, in other words, of oxidizing agents, I used intramine and colloidal iodine, with the result that, among my own cases, I have not seen, since 1915, a single case simulating reinfection, nor one of a general neuro-recurrence.

I will only consider the so-called reinfection here, for I have recently written an article on nervous syphilis (*Med. Press and Circ.*, June 1917). That the sore appears with the usual incubation period after a connection means nothing, because such cases have occurred when there has been no connection, and because any irritant may be the cause of a sore, which will appear after the usual incubation period. In some cases of a recurrent chancre, spirochætæ are found, and in others they are not. If present, it can generally be assumed that treatment of the original infection was begun very early; whilst, if not present, the chances are that the treatment was not begun until the patient had had the sore for some time, or until he had just entered the generalization stage. Therefore, the presence of spirochætæ, even if found in abundance, cannot be held as a criterion of a true reinfection. The Wassermann reaction is usually negative, which is only to be expected, for a recurrence would not have taken on the characters of a chancre, if the host had previously had to form for a certain period a circulating protective substance, generally called antibody. A recurrent chancre usually appears on the same site as the original, or in juxtaposition to it, which is only to be expected, because intensive arsenical treatment does not kill the spores of the organism of syphilis, and spores both remain locally and spread peripherally.

One other point is that, as a rule, the inguinal adenitis following a recurrent chancre is not so pronounced as that accompanying the original sore. If the host has not had to form a protective substance for an extended period, or until he has become used to doing so, as he does in all chronic infections, even beyond the time when all the organisms he is combating have been vanquished, a condition we call immunity, and as intensive treatment has the effect of reducing the host's resistance, it stands to reason that, should the spores reawake, the host's response will be the same as when he originally became infected, with the result that the recurrence will simulate a chancre.

The next grade is when the host has formed a resisting substance over a longer period than in the instance just cited. In this grade, the recurrent chancre bears the following characteristics: it is, as a rule, raised; the lesion has a swollen appearance; the surface tends to be more that of an ulcer than an erosion; it is more purulent; there is more circumferential inflammation and less induration. If the patient had entered the generalization stage before treatment was begun, the recurrence seldom simulates a chancre, but it may sometimes do so; in fact, I have seen a recurrent chancre on the neck, following an irritation six weeks previously, and I have also seen a recurrent chancre on the penis, while on the scrotum the patient had a recurrent orbicular papular syphilide. These were two of the cases which made me wonder whether what I had diagnosed as reinfections were really so.

It is absolutely impossible at present, in some cases, to say whether one has to deal with true reinfection or a recurrent chancre, but going solely by my clinical experience, I should say that over 95 per cent. of the published cases of reinfection, following salvarsan within six months of the cessation of treatment, are really recurrences.

Should a recurrence occur in the next grade, that is to say, when treatment was not begun until the patient had entered the generalization stage, it may be an exact replica of the lesions the patient originally presented, it may be a neuro-recurrence, localized or general, or the lesions may be destructive and simulate gummata. The severest lesions, in both the systemic and the nervous parts of the body, have always been in those cases which have been treated most drastically with arsenic and mercury.

Besides injuring nerve cells, which it readily does, arsenic exerts a toxic action on the endothelial cells and walls of blood-vessels, a fact which has not been sufficiently emphasized. I have seen two cases, in which arsenic definitely caused hemiplegia.

I will now cite three cases, which bear out what has just been said :—

Case 5.—In August, 1914, a patient had a single primary sore on the prepuce. He was treated with five intravenous injections of galyl, and with intramuscular injections of mercury for six months. In April, 1916, a pseudo-chancre appeared on the prepuce, close to where the original sore had been. The patient then had 11 intravenous injections of kharsivan, and 12 intramuscular injections of mercury. The sore just healed as the eleventh injection of kharsivan was given. In January, 1917, two pseudo-chancres appeared on the skin of the penis. I injected colloidal iodine intravenously, and 5 cc. of intramine intramuscularly, with the result that in a week's time the sores had completely healed, and the induration accompanying them had disappeared. This identical case has been described by another observer as a reinfection.

Case 6.—A patient came for treatment, when the rash had only just entered the macular stage. He had received nine intravenous injections of galyl, and three courses of mercurial injections. Before finishing the third course a large gumma appeared on the back and another on the abdomen. The Wassermann reaction was negative, as it usually is in such cases. Five more injections of galyl were prescribed, without any effect whatever; within ten days, after one injection of intramine, both gummata had completely healed, and the patient felt better than he had done for months.

Case 7.—The patient, a man, aged 32, had a primary sore on the prepuce, and had just entered the generalization stage when treatment was begun in June, 1916. The treatment consisted of 11 intravenous injections of kharsivan and seven intramuscular injections of mercury, which ended in August, 1916. Two months later the patient developed bad headaches and unsteadiness of gait. He soon became deaf in the left ear and had double vision. The pupils were unequal, the bilateral discs were choked, and there was paresis of the left auditory and oculo-motor nerves—due to basilar meningitis. The reflexes of the upper extremities were exaggerated; in the lower extremities they were unequal and diminished. Romberg's sign was present, the patient had pains down one leg, and had lost all sexual desire—due to a meningo-myelitis. An examination of the cerebro-spinal fluid revealed the following: Pressure raised; positive lymphocytosis, 650 cells per c.mm.; albumen and globulin increased; Wassermann reaction positive. From October, 1916, until the above examination was made, in January, 1917, the Wassermann reaction of the blood was negative (tested three times). Under colloidal iodine, colloidal mercury, and intramine, injected intravenously and intraspinally (prepared serum), the patient recovered.

All treatment with drugs, which may be called more or less specific, stimulate and accelerate, as I have already pointed out, the protective substance of the host (protein colloidal particles in the serum), but this is the point to be borne in mind, namely, that their continued use destroys, by over-taxation, the very action their moderate use assists. The continued use of arsenic cannot indefinitely increase the oxidizing action of the protein colloidal particles any more than a fighter can go on fighting when his muscles have done their full. The fighter's muscles want rest and further nourishment, before they can do their work again; it is the same with the protein particles, they want some more peroxide for the arsenic to act upon. As the peroxide is formed in the reducing action, an action dependent upon sulphur, it is clear that intramine, an organic sulphur compound, if properly employed, can only be of the very greatest use, and that as mercury has a similar action to arsenic, it is unwise to combine it with arsenic or to follow up the arsenic treatment with it alone.

Critics have said that intramine has no action on syphilitic lesions, and therefore cannot replace salvarsan. I do not want it to replace salvarsan; it cannot, it merely prepares the ground for the action of arsenic. A bullet can kill a man, not *per se*, but by means of the man who fires it. The man is the protein, the bullet the oxidizing action, the rifle the peroxide. Mercury, as it has a similar action to arsenic, is merely another bullet, therefore intensive arsenical treatment should not be followed by mercury alone, the rifle must always be present, which intramine supplies. Just as the rifle is not the instrument which kills the man, so intramine is not the drug which directly gets rid of the syphilitic symptoms. A rifle with a bayonet fixed will kill a man directly, provided he is at sufficiently close quarters, so intramine alone, without the addition of an extra oxidizing agent, will get rid of certain symptoms of syphilis. In certain cases of late syphilis, the reducing action of the protein particles is more to the fore than the oxidizing action, therefore a reducing agent has to be mainly, and can be solely, relied upon to produce the necessary effect.

Roughly speaking, oxidizing agents are mostly required in early and reducing agents in late syphilis, but since reduction is only a preliminary to oxidation, oxidizing agents in all stages are, comparatively, more required than reducing agents. For the sake of convenience and help to others, I have brought out a scheme for the treatment of syphilis, advising the use, in early syphilis, of oxidizing agents first, and in late syphilis the use of reducing agents first. This has been severely commented upon, on the ground that individual treatment is thereby neglected. On the contrary, no one treats his cases more individually than I do, but since no two cases are exactly alike and since I am unable to tell beforehand whether it is mainly the oxidizing or the reducing action of the protein which requires the greater stimulus, it is impossible for me to put in print more than generalities.

I have come across many cases of late syphilis, in which the initial use of a reducing agent has had no naked eye effect, or has even made the lesion temporarily worse; but I know that the immediate employment of oxidizing agents will convert a temporary loss into a greater gain.

Here, I can only say that the combined use of oxidizing and reducing agents will benefit the patient far more than the sole use of either, and that treatment requires to be more individual than ever it was before. This is an extremely interesting point. Several injections of salvarsan will, in early syphilis, convert a positive Wassermann reaction into a negative, which is read by the unwary as a sign of a cure. If intramine is now given, the reaction may become again positive. This teaches us that intramine can restore the protective substance of the host when salvarsan has destroyed it; that treatment, so far as it concerns a cure, cannot be regulated by the Wassermann reaction; and that a positive reaction, far from signifying that the patient is still actively syphilitic, may mean that the patient's resistance against the disease is at its best, and that he would only be harmed by further treatment. This point of view I have tried to impress upon my readers for some time past.

THE TREATMENT OF GONORRHŒA.

Although bacterial diseases can be treated as well by means of oxidizing and reducing agents, and although the same drugs can be used in almost all of them, the treatment becomes still more individual, because as the size and number of the specific protein colloidal particles are not so great as in protozoal diseases, greater care has to be exercised in three directions: (1) the choice between a reducing and an oxidizing agent, (2) the number of injections to be employed, (3) the dose of the drug.

I will now give a brief outline of my treatment of gonorrhœa, based upon oxidation and reduction. When a patient reports with an acute discharge, I order two irrigations daily of potassium permanganate, 1 in 8,000. When the purulent discharge becomes muco-purulent, two irrigations daily of potassium permanganate, 1 in 4,000, are used. When the discharge has practically ceased, the patient irrigates twice a day with zinc permanganate, 1 in 8,000. Later still, a daily irrigation of zinc permanganate, 1 in 4,000, may be employed, but it is seldom called for. On admission, I inject 1·5 cc. of colloidal manganese intramuscularly, and repeat the injection on the following day or 48 hours later. Two or three days later 2 cc. are injected. In several cases, the discharge has completely stopped by this time, but if it has not, increasing doses of colloidal manganese up to 6 cc. are employed every third or fourth day until the discharge has ceased. The introduction of colloidal manganese cures many cases in ten days, although in others it does not seem to do so well; but in all, provided the patient is treated individually, *i.e.*, the dose regulated by the focal reaction, the pain, chordee, etc., are eliminated. If a case hangs fire, it is a good plan to combine colloidal antimony with colloidal manganese, using slightly smaller doses of the latter, beginning with 1 cc. and going up to 3 cc. of the former.

In recurrent or old standing cases I combine manganese and antimony straight away or use manganese alone, but in these great care must be exercised in the dose used, because an overdose will cause a temporary aggravation of the discharge.

In recurrent, or long-standing cases, complicated by a staphylococcic infection in the form of a peri-urethral abscess, prostatic abscess, or suppurating epididymitis, colloidal manganese has a wonderful action, as the following case will show :—

CASE 8.—A man had a large, perineal, peri-urethral abscess, which was extremely painful and prevented him from moving. The abscess had not pointed, but nevertheless the question of an incision arose. The day following an intramuscular injection of colloidal manganese, 3 cc., the pain vanished, and a day later the patient could walk about, and only a hard lump remained to show where the abscess had been. In acute, simple, gonococcal epididymitis and funiculitis, the pain and swelling will vanish within 24 hours of an injection of 3 cc. colloidal manganese.

In gonorrhœal rheumatism, it will be noted that the rheumatism, as a rule, sets in after the discharge has stopped; therefore it is, so to speak, a chronic manifestation of the disease. This being the case, it is best to begin with intramine. Intramine will do for gonorrhœal arthritis what no other drug will. Another point about intramine is that the better the result obtained the greater the reaction the patient has on the day of the injection. Sweating is profuse, and the temperature may rise to 104° F. Intramine, injected intramuscularly, gives better results than when it is injected intravenously, but by the latter method the reaction is less severe. If I employ the intramuscular route, I inject 2·5 cc., and repeat the same dose four or five days later, and three or four days later still 3 cc. of colloidal manganese, alone or with colloidal antimony.

In practically every case, the pain in the joints disappears on the day following the first injection, and many cases are definitely cured in from 10 to 14 days later.

If I use intramine intravenously, I adopt the following course :—First, 100 cc. of colloidal iodine, 24 to 48 hours later 100 cc. of intramine, the same dose of which is repeated four to five days later, and two to three later still an intramuscular injection of colloidal manganese.

I have treated over 50 cases of gonorrhœal rheumatism in the way just described, and always with most striking results, far more striking than I have ever seen obtained with vaccines.

The following case will give a good idea of what can be achieved in gonorrhœal rheumatism by means of chemotherapeutic agents :—

CASE 9.—The patient had had gonorrhœal rheumatism and arthritis for three months, having been in bed all this time. The following joints were involved : the right shoulder joint, both wrists, several fingers, the left hip, both knees and ankles, and some toes. The pain was intense, and some of the joints had fluid in them. The case was also complicated by keratodermia blenorrhagica. The joints were extremely painful, and the patient was scarcely able to move. All kinds of treatment had been tried, including sensitized vaccines, without avail. The patient received 2·5 cc. of intramine intramuscularly. The same evening the temperature rose to 103·5° F., and sweating was profuse. The next morning the pain had practically left the joints, and the patient was able to move them. Two days later the intramine was repeated, and three days later still an intramuscular injection of colloidal manganese, 3 cc., was prescribed. After fifteen days convalescence, the patient was discharged from the hospital cured.

Intramine also has a beneficial effect upon the urethra and prostate in these cases, and, well diluted, is useful as an instillation into the posterior part of the urethra in intractable cases of gleet.

I have never seen so many and such severe cases of gonorrhœal arthritis, as I have since this world-war began. The soldiers most affected have been combatants, an important point, as will be seen in a moment. The arthritis is often marked by extreme wasting, and not infrequently accompanied by keratodermia blenorrhagica. During the last two years, I have seen 17 cases of severe gonococcal arthritis, associated with keratodermia blenorrhagica, and in most of the cases the patient was extremely wasted and feeble. In 14 of the 17 cases the patient had never had gonococcal arthritis before.

Two other skin conditions, which have increased since the war, are vitiligo and dermatitis herpetiformis. Vitiligo is not uncommonly an early symptom of syphilitic degenerative myelitis. Dermatitis herpetiformis is, in many respects, a widespread condition of herpes zoster, which latter is due to inflammation of the posterior root ganglion or of the meninges covering it. I therefore examined the cerebro-spinal fluid of some cases of vitiligo, dermatitis herpetiformis, and keratodermia blenorrhagica, and found that there was a lymphocytosis which averaged about 16 cells per c.mm. This points to meningeal irritation. The lesion of degenerative myelitis (tabes) is frequently in the meninges primarily, and it is in the meningeal form that wasting of the patient is most pronounced; vitiligo is most common, and herpes zoster is a prodromal sign. Therefore, the severe wasting met with in gonorrhœal arthritis is probably due to a gonotoxic meningeal inflammation, which irritates the trophic fibres in the posterior nerve roots. As hexamine is supposed to liberate formaldehyde in the cerebro-spinal fluid, I treated three cases of dermatitis herpetiformis with this drug; in all three the rash disappeared, and no fresh lesions occurred while the patient was taking it.

In combatant soldiers, owing to the strain they undergo, there can be no doubt that the meninges are more susceptible to toxins than in non-combatants, a point still further emphasized by the great increase and rapidity of onset of degenerative lesions in the nervous system in patients who have had syphilis and thought themselves cured.

While on the subject of the treatment of gonorrhœa, I must strike a note of warning about instrumentation. The number of soldiers affected by gonorrhœa and the length of time they are incapacitated is appalling. The latter is largely due to too drastic treatment on the part of the medical officer. Except under exceptional circumstances the prostate should never be massaged, and an instrument should never be passed while the patient has a discharge. Massage of the prostate is useful, but it should never be done more than twice a week for two or three weeks, and care should always be exercised. Recently, I have seen five cases of fistula caused by too energetic massage of the prostate. If instruments are to be passed, soft ones are preferable to metal. It is very seldom that I use a metal instrument, except an irrigating, posterior, Kollmann's dilator. I never pass an instrument unless compelled to, and then never more than twice a week. It is astonishing how easily strictures may be dilated with gum elastic bougies or catheters only.

As the introduction of colloidal manganese is going to make a great difference in the treatment of gonorrhœa, I am preparing an article devoted solely to it. Another article on the treatment of staphylococcic infections with colloidal manganese is already in the press. (*Med. Press and Circ.*)

In closing, I would beg those of my readers who have been so persistent in opposing my work, because they do not understand it, or because it runs counter to current opinion on the subject, to attempt to follow what I have written, or at least to give the experiments sufficient trial before pronouncing judgement upon them. Current opinion is what I once held myself, and I should not have altered my views, if they had been sufficient to solve the many difficulties the subject presents to us. Finally, medicine is the most inexact of the sciences, and one in which finality can never be reached; accordingly, what is done to-day can be improved upon to-morrow.

A MINISTRY OF HEALTH.

By A. W. RUSSELL, M.A., M.B., C.M.

Surgeon to the Royal Samaritan Hospital for Women, Glasgow; Obstetric Physician, Glasgow Royal Maternity and Women's Hospital; Member of Medical Advisory Board of the Consumptive Sanatoria of Scotland.

DURING the present year, in spite of the pre-occupation of the popular mind with the concerns of war, there has arisen a remarkable agitation for the creation of a distinctive Ministry of Health, and the time seems ripe for a critical examination of the question.

Since the beginning of the present century all serious minds have been turned with increasing alarm to the continuous and appalling loss of life, largely preventable, which results from ante-natal causes, infantile mortality, the death of mothers from the incidents of childbirth, tuberculosis, venereal diseases, and alcoholism. Notwithstanding the preventive measures and enlightened action that have resulted, the nation is still losing every year from five to six thousand mothers during childbirth; probably over a quarter of a million of the infants born, apparently healthy, never get beyond their fifth birthday; from sixty to eighty thousand die from tuberculous disease; alcoholism and venereal diseases are claiming a heavy annual toll, more difficult to estimate with accuracy but surely alarming to the mind when the recent Royal Commission has allowed its deliberate opinion to be published that 10 per cent. of the adult population in our towns have syphilis, while alcoholism, so prevalent as to be a menace to the health of the race, is itself directly responsible for many deaths and a serious factor in the production of the other ills already mentioned.

Our terrible losses by the war give greater cogency to the growing demand for legislation that will check these constant and probably even greater drains upon the nation's vitality, and it is not surprising that corporations, chambers of trade and commerce, burgh associations, societies of Medical Officers of Health, insurance societies and other bodies are passing resolutions and sending deputations to Ministers of State in favour of this movement.

We are not disparaging the excellent work accomplished in the past by existing authorities, such as the Local Government Board, when we seek to direct wider attention to this question, to expose the imperfections of past methods, already admitted by those in office and beginning to be realized by the popular mind, and to show that the proper co-ordination of the various branches of public health work can only be accomplished by the creation of a separate Minister of Health, with a highly trained staff and sufficient financial provision both for research and treatment. Special emphasis requires to be laid on the need for liberal encouragement of research.

THE STUDY OF THE PAST DESIRABLE.

In so important an inquiry it is well, first of all, to study and review the origins and lines of progress of health institutions in so far as they affect the present question. Nations and States, from the earliest times, have been concerned about the health of their inhabitants, and have always recognized the importance of air, water, food, shelter, and clothing. The marvellous sanitary code of the ancient Jews is revealed in the early books of the Old Testament, and literature has preserved a record of the health laws of the Romans, while their sanitary works still stand as monuments of their skill and industry. All through later centuries one may discover interesting incidents, such as the building of leper houses, the inflicting of penalties for casting filth and refuse into rivers and ditches, or the slaughtering of cattle in towns, which prove that mediæval governments were not utterly indifferent to the health of the community. It is recorded that Shakespeare's father, in the sixteenth century, was fined for depositing refuse on the street, and for not keeping his gutters clean. Nevertheless, writers on the life of the people, in the fifteenth to the eighteenth century, have sometimes thrown a lurid light on the insanitary conditions of living in those days, especially after industrial developments consequent on the invention of machinery had tended to concentrate the working classes in crowded areas. So abnormal were the conditions of life, that in some plague-spots the annual death-rate was 1 in 30 of the population.

SANITARY SCIENCE OF RECENT DATE.

Those who are not familiar with the history of sanitary progress will probably be surprised to learn that it is only after we reach the nineteenth century, that the first real effort is made by a Central Government to control the health of even a section of the community by the passing of the first Factory Act. An old law, dating back to 1601, provided for the "necessary relief of the lame, impotent, old, blind, and such other among them being poor and not able to work," and it continued almost to the middle of the last century to give the only available warrant to the existing Poor Law Commissioners for the employment and remuneration of Poor Law Medical Officers for attendance on the sick poor. These Commissioners were appointed in 1834, with Edwin Chadwick as secretary, a name to be gratefully remembered, and their subsequent reports are specially interesting and important, for it is owing to the investigations therein described that the legislation was initiated which has given us the splendid series of Public Health Acts by which this country is now benefiting so greatly.

THE GENERAL BOARD OF HEALTH.

Chadwick's mind was progressive and travelled farther and faster than the minds of the Poor Law Commissioners, and out of this fortunate difference of opinion there arose a new Government Department, the General Board of Health. This, be it noted, took place so recently as the middle of the nineteenth century—less than 70 years ago, and it is within this "allotted span" of one man's lifetime that the numerous and diverse sanitary laws have been passed and the complicated machinery of Public Health has been set up. This General Board of Health had a brief and stormy experience, and in 1858, the year of the passing of the Medical Act, which established the Medical Register and gave the medical profession its proper status, this unwelcome embryo of a future Ministry of Health was put out of existence. This act of violence has been characterized by Sir John Simon as a "catastrophe," owing not only to its immediate effects but also to the persisting evil influence of the feeling aroused at the time. The duties of this Board devolved, afterwards, partly on the Home Office, partly on the Privy Council, and complete disaster was probably averted only by the retention of the former Secretary of the Board, Sir John Simon, as the paid Medical Officer of the latter body. It is to his genius and industry that the nation owes many services to the cause of Public Health, besides his classic *History of Sanitary Institutions.* Owing to the great social changes resulting from industrial development and the insanitary conditions of life in crowded areas, legislation from this time onward was necessarily varied and frequent, but it was so badly co-ordinated, so conflicting, and so inefficiently carried out that

A ROYAL SANITARY COMMISSION

was appointed to deal with it, and sat during 1869, 1870, and 1871. The Report of this Commission reveals a complexity and irregularity of legislation that is well illustrated in the following extract from a writer on the subject: "No less than six departments of the Central Government acted in respect of public health, and it was 'quite possible that on the same day inspectors from the different offices might visit a town for sanitary purposes without any cognizance of the presence of each other.' The confusion in the Central Government had its parallel among the local authorities: 'in all country districts there is one authority for every privy and another for every pigstye; but with regard to the privy, one authority is expected to prevent it being a nuisance, and the other to require it to be put to rights if it be a nuisance.' Three different authorities were in operation in some districts, and it was shown that 'the sewer authority might provide hospitals, but it had no staff of medical officers to carry its powers into execution,' whilst 'the nuisance authority had a staff quite ready and daily at work, but it was not empowered to provide the accommodation.'"

AN OPPORTUNITY MISSED.

A great opportunity was missed by this Commission, and by the Parliament which considered its Report. Its recommendations failed in enterprise, while prejudice, ignorance, and vested interest played their evil part, so that instead of a responsible, properly organized Board or Ministry of

Health, with an official Head or Minister, a phantom Board was created, consisting of the Lord President of Council, five Principal Secretaries of State, the Lord Privy Seal, the Chancellor of the Exchequer, and a President appointed by the Sovereign.

THE ORIGIN OF THE LOCAL GOVERNMENT BOARD.

This new central authority, called the Local Government Board, may have looked well on paper, but it was a mere outward appearance of consolidation, and it really became only a nominal union of the staffs of the old Poor Law Board and the General Register Office, together with some of the medical duties of the Privy Council, and each of these departments has remained independent and continues to work on its own lines. But for the creation of the paid office of President, with his Parliamentary and Permanent Under Secretaries, this new Board would have been a fiasco, but the medical and sanitary work were centred in him and his officials. As need arises, therefore, we find great activity displayed in the passing of the Public Health Acts of 1872, 1874, and 1875, and many other Acts which will occur to the mind of every reader.

THE LIMITATIONS OF PARLIAMENT.

We are too conscious of the great work accomplished by the successive Presidents and their highly trained staff, composed largely of medical and sanitary experts, to seek to be hypercritical or censorious, but Parliament has lamentably failed to grapple effectually with the growing difficulties of health legislation, and has allowed a temporizing policy of expediency to be followed, which has hampered our scientific genius and put a heavy drag upon our enterprise. It looks, indeed, at the moment of writing, if we may trust the report of a recent speech of the Prime Minister, as if he of all men has committed himself also to this fatal policy, a point of view markedly in contrast with the pronounced and outspoken opinions of Lord Rhondda, when he was President of the Local Government Board.

When Parliament is compelled by the development of public opinion or some other circumstance to take up a new line of investigation, such as Maternal Welfare, Notification of Births, Infantile Mortality, the Care of School

Children, Infectious Diseases, Tuberculosis, Factory Inspection and Compensation for Injuries, National Insurance against Sickness, or Venereal Diseases, what has been its method? Almost invariably the medical side of the question is dealt with by the creation of a new department and the appointment of a new set of officers, with little or no attempt at correlation with existing agencies. Had the Local Government Board been a really active body of men interested and versed in health questions with an expert and responsible Head, surely this method would have been impossible.

AND WHAT HAS BEEN THE RESULT?

Look at the remarkable state of affairs created by such piecemeal legislation. We have: (1) The Local Government Board, with its two distinct medical staffs for Poor Law and Public Health. We must remember, also, that besides these, it has other functions. (2) The Home Office, which, among its many other duties, deals with (*a*) certain health regulations and factory diseases; (*b*) Inebriates; (*c*) mental deficiency; (*d*) the Prison Medical Service. (3) The Registrar-General who keeps the Register of Births, Deaths and Marriages, and is responsible for certain vital statistics. (4) The Board of Education, which is charged with the medical inspection and treatment of school children. (5) the National Insurance Act, with its four separate Commissions, each with its medical staff, and these in touch with a fifth body, the Joint Committee. (6) The Privy Council, in relation to the Central Midwives Board. (7) The General Medical Council, with its control of medical education and other duties. (8) The Board of Agriculture, in relation to foods. (9) The Board of Trade. (10) The Colonial Office. (11) The Board of Customs and Excise. (12) The Post Office. (13) The War Office. (14) The Admiralty. (15) The Judiciary, with its Lunacy Committees and Masters and Visitors in Lunacy. (16) The Pharmaceutical Society. All of these are more or less intimately concerned with medical matters, and the tangle looks hopeless.

MULTIPLICITY IN LOCAL ADMINISTRATION.

The same tendency to multiplicity can be illustrated from the doings of Local Health authorities.

A recent writer has compiled a list of inspectors and officials from whom a working-class mother, with a family of children, may now receive visits. "The list," he goes on to say, "includes the Medical Officer of Health, the Sanitary Inspector, the Housing Inspector, the Health Visitor, the School Attendance Officer, the School Nurse, the District Nurse, a member of the School Care Committee, the Sick Visitor or Agent of her Approved Society, the Insurance Inspector, and, in cases of poverty, the Relieving Officer, and perhaps a representative from the Charity Organisation Society." It is well known that this continual series of inspections among the working classes has given rise to a widespread feeling of irritation, and a sense of infringement of privacy. The most recent movement is one for notification of pregnancy, and already certain local authorities (*e.g.*, at Nottingham and Huddersfield) have instituted a system of such notifications, though it is not clear under what powers they have acted. If the visits of these inspectors and officials were productive of proportionate benefit, a great deal could be said in their defence, but it is doubtful whether the whole system is having any appreciable effect in improving the health of the working classes or reducing the death-rate. With the exception, perhaps, of the Sanitary Inspector, they do little or nothing to improve the environment; they do not provide healthy conditions of life or efficient medical attendance, or lying-in homes for mothers. As Mr. G. K. Chesterton has said: "They only move persons from Schedule A to Schedule B, while they lead the poor to feel that their liberty is infringed in a way the rich would not tolerate."

At a Conference last March between Lord Rhondda, the President of the Local Government at the time, and representatives of the British Medical Association, one of the spokesmen instanced the fact that nine doctors (working under the regulations of five Government Departments) might be concerned at various times with the medical care of a single family. Another writer has pointed out that the health of children is, by present arrangements, under the control of five separate departments—(*a*) In school, under the Board of Education; (*b*) Before school age and while at home afterwards, under the Local Government Board; (*c*) In his employment in industry, under the Home Office; (*d*) As regards the quality of his food, under the Board of Agriculture; (*e*) As the dependent of an insured person or as the beneficiary from maternity benefit, under the Insurance Commission.

THE METHOD OF OFFICE WORK.

The same lack of correlation even in the routine work of the various offices has been well exposed by Dr. W. A. Brend in his new book on *Health and the State*. He puts it so tersely and clearly that we take the liberty of quoting him :—" The lack of co-ordination among Government Departments is almost incredible to those who have not had actual experience of their internal working. There are instances of one Department laboriously setting to work to collect information on a subject, full details of which are in possession of another Department, and have perhaps actually been published; of two Departments independently making precisely the same investigation; of one Department not knowing what another has done or is doing; and of one not being able to take an obviously desirable step because it would infringe the prerogative of another. These matters do not usually become public, but we have a striking illustration of the want of co-ordination in the annual returns and statistics published by the different offices."

Instances in abundance will be found in these returns and elsewhere to demonstrate the inchoate character of the methods of health legislation, the consequent handicapping of their efficiency, and the wasteful overlapping, but we have probably said enough to prove our argument, and at the same time give point and force to the agitation which is now gathering support in many quarters.

THE PRESENT AGITATION.

It is well to remember that this is by no means the first time that there has been a movement in favour of a special Ministry of Health.

(1) A Committee of the British Medical Association, so long ago as 1868, made a definite recommendation in favour of it, and their action was endorsed by a Royal Commission next year, but it was not included in the Public Health Act of 1875.

(2) Dr. Benjamin Ward Richardson, an advanced and

independent thinker and a man whose work deserves to be remembered, delivered an important address on a "Ministry of Health" to the Sanitary Institute of Great Britain at its Stafford Congress in 1878, with Mr. Edwin Chadwick in the Chair. His clear setting forth of his plea might have been written yesterday.

(3) Again in 1904 and 1911, the British Medical Association attempted to bring the matter forward, this time on the lines of a remodelling of the Local Government Board.

(4) The Press has been active from time to time, and can still give even more effective help. What seemed to be an inspired notice in a London daily some months ago, as to a contemplated legislation for expectant mothers, started an inquiry by the British Medical Association, and led to a Conference between Lord Rhondda and a deputation of the Association. At this Conference last March Lord Rhondda, in his introductory welcome to the deputation, admitted the overlapping of departments, with its consequent danger of friction, unnecessary expense, and waste of energy. He explained that the Bill, which was immediately in his mind, would deal with maternity and infant welfare. He made the welcome declaration that the general practitioner would be recognized and his help secured, and he showed that he, for one, believed in a single Department or Ministry embracing all matters concerning Public Health. The British Medical Association has since considered the subject in a Special Committee, which has already issued a supplement to the *Journal* for May 5, 1917, containing a summary of the present movement, and a series of recommendations. These, with the special articles on the subject in its columns during the last few months, should be of considerable assistance to the Government in planning this important and necessary reform.

The *Glasgow Herald* has recently opened its columns to special articles, and an extensive correspondence on the subject, that should bear fruit.

(5) Two pamphlets deserve notice One was published some months ago under the title "The Health of the People: a New National Policy." Its motto should be committed to memory: "Public Health is purchasable; within natural limitations a community can determine its own death-rate." It gives an account of a series of inquiries

by a body of Unionist members of Parliament, with Mr. Waldorf Astor as Chairman, during 1913–1914, into various social questions, and details the conclusions they reached as regards Public Health. The other has just been issued as a Memorandum, entitled: "Scheme for a Ministry of Health and of the Functions to be transferred to it." It has the signatures of ten men who are evidently representative of industrial and insurance interests, and who, like the Unionist members above mentioned, have met to study these modern health questions. It presents a strong case for the immediate consideration of this subject and for the appointment of a Minister of Health.

(6) On the literary side of the subject, while remembering the general value of Sir John Simon's great "History of Sanitary Institutions," and the suggestive address of Dr. B. W. Richardson in "A Ministry of Health and other Addresses," we must not omit mention of the following recent works: "The State and the Doctor," by Sidney and Beatrice Webb (1910); "English Public Health Administration," by B. G. Bannington (1915); and "Health and the State," by W. A. Brend (1917). The facts and arguments marshalled by Dr. Brend are incontrovertible.

THE ERRORS OF THE PAST.

Some of the errors of past legislation lie on the surface of what we have already said, and are easily gathered. We note the following here:—

(1) It is an extraordinary and inexplicable anomaly that the President of the Board should be a layman without any medical or scientific training. Someone has said that there has not been a medical man in the Cabinet for the last 60 years! It should be the indispensable qualification of the man who occupies the chief post in any health office that he has had a varied and wide experience of medical work. Such an office, too, should not be readily subject to political mutation.

(2) There is no efficient central statistical office, which would regulate the lines of investigation or give information about statistics already collected. Government Commissions and others have in vain

drawn attention in the past to the almost complete absence of proper statistics of the work of our hospitals. This demands serious attention.

(3) Research has in the past been miserably provided for. We are realizing that this is the foundation of all sound treatment.

(4) Legislation has usually been piecemeal and independent. At present, a Public Health Bill may even pass through the Legislature without receiving expert consideration. This should be impossible.

(5) England and Wales, Scotland, and Ireland are often on a different footing as to their sanitary and Health laws. It should be one law and one administration for the United Kingdom. The futility of any other arrangement might be illustrated in the matter of statistics of the Registrar-General as well as elsewhere. Of Scotland in this respect, Professor Karl Pearson said some time ago that "the data provided by her Registrar-General rank almost at the bottom of European statistics."

THE OUTCOME OF THIS INQUIRY.

Many suggestions might be offered if there were space and time, but all seem to the writer to depend upon one great central idea, which looms before him and fills his mind as he concludes this article. A great general is not less necessary in a great war than is the man of proper gifts as the head and soul of what should be accepted as the most important department of State, for it is charged with the health of the nation. No difficulty as to the means of reaching it, no thought of the interests that have to be disturbed, no question of political policy, no temptation to accept an easy *via media* of compromise, which has been fatal to progress in the past, should deter the Government from taking the necessary steps at once, whether by Royal Commission or by direct legislation, which will culminate without undue delay in the appointment of a Minister of Health, possessing the most complete qualifications and provided with the necessary expert staff and equipment for carrying out the higher and wider ideals now needed in this important office.

A SWALLOWED THREAD AS A GUIDE IN INSTRUMENTATION OF THE NARROWED ŒSOPHAGUS, WITH A REPORT OF A CASE OF CARDIOSPASM IN WHICH THE METHOD WAS EMPLOYED.

By C. HAMILTON WHITEFORD, M.R.C.S., L.R.C.P.

Late Specialist in Surgery, Military Hospital, Devonport, etc.

In the following article, the writer has drawn freely from the writings of Dr. H. S. Plummer of the Mayo Clinic. In 1903, Dunham described his method of dilating a stenosed œsophagus, by making the patient swallow a thread, which was then withdrawn from the stomach through a gastrostomy opening, and used for drawing down spindle-shaped sounds through the stricture.

In 1909, Mixter modified Dunham's method by allowing the thread to travel into the intestine sufficiently far to allow of its being drawn taut, thus eliminating the need for a gastrostomy.

Plummer has employed Mixter's method in many hundreds of cases of various forms of œsophageal stenosis, with only a single case in which perforation of the œsophagus ensued. Plummer points out that, in passing instruments through a narrowed œsophagus, the two rules of safety are that—

(1) The tip of the instrument must be constantly under the guidance of vision; or

(2) The instrument must follow a guide in such a way as to make perforation of the œsophageal wall with its tip impossible.

For Rule No. 1, the use of the œsophagoscope, often with the aid of a general anæsthetic, is essential, and, even in the hands of the most experienced, œsophagoscopy is not entirely devoid of risk. The cases in which perforation has occurred during œsophagoscopy are not usually recorded. To a conscious patient the passage of the œsophagoscope is frequently a severe ordeal.

Plummer employs a sound with an olive-shaped head. The olive is perforated obliquely, from apex to shoulder, by a fine canal, through which the thread is passed. An important feature of the sound is that the portion of the shaft, immediately above the olive is made of flexible spiral metal. It is this flexibility which makes it difficult to exercise direct pressure sufficient to perforate the distorted and dilated œsophagus.

For cases of cardiospasm, Plummer employs a hollow sound with flexible end and perforated olive-head, a sausage-shaped rubber bag, silk-covered, surrounding the shaft, just above the olive. The collapsed bag is passed into the area to be dilated, following the olive, which is slid along the swallowed. thread. The bag is then distended with water, the degree of pressure employed being registered on a gauge. Among those who have used a dilating bag for œsophageal stenosis are Russell (in 1898) and Lockwood (in 1903).

The following case was recently treated by the writer :—

The patient, a married lady, aged 51, with a grown-up family, began, two years ago, to have difficulty in swallowing solids, which caused discomfort behind the lower sternum, " as if a fishbone had stuck in the throat." This discomfort increased, large quantities of saliva being regurgitated, together with portions of food, whenever solids were attempted.

Present Condition.—The patient is thin, but not emaciated. Nothing abnormal is found in the neck or abdomen. Attempts at swallowing any solid invariably result in retro-sternal pain, which persists until the solids are vomited. During the past month only liquid food has been taken. The history and symptoms suggested the possibility of an œsophageal diverticulum.

After ingestion of half-a-pint of bismuth and milk, the swallowing of which was slow and difficult, a skiagram was taken, including the thorax and upper abdomen, and showed that the œsophagus above the diaphragm was dilated throughout to a diameter of two inches, its right lower wall being displaced, downwards and to the right, forming a bulge which lay on the diaphragm. Sufficient bismuth had passed into the stomach to show below the diaphragm as a narrow line, two inches in length, connecting the extreme left of the bottom of the dilated œsophagus with a hook-shaped stomach, the position of which was nearly vertical.

Six hours after taking the bismuth, the fluorescent screen showed that most of the bismuth had left the stomach, some being seen in the transverse colon.

Owing to the war, a delay of six weeks occurred before a set of olive-headed sounds was available, no dilating bag could be obtained.

TREATMENT.

1*st and* 2*nd Days.*—The patient, in 48 hours, swallowed five yards of "button hole" silk thread, at the rate of about one foot per hour. The thread was of a light pink colour, which was inconspicuous and was looped over the ear, the unswallowed portion being coiled on a card which was pinned inside the blouse.

3*rd Day.*—Sound, with olive ⅓-inch diameter, passed along the thread 16 inches from teeth. Fluorescent screen failed to localize the olive.

4*th Day.*—Sound again passed for 16 inches, the screen showed the olive at level of diaphragm, close to midline.

5*th Day.*—Longer sound passed 20 inches from teeth. Screen showed the olive in stomach, on level of a line joining the lower costal margins.

6*th Day.*—The patient was given a rest.

7*th Day.*—Sound, with ½-inch diameter olive, passed for 20 inches. The olive was seen, on the screen, to descend to the bottom of the œsophagus, close to the midline, and then to turn to the left before entering the stomach.

8*th Day.*—Sound, with ⅔-inch diameter olive, passed. On this day the thread appeared at the anus.

9*th Day.*—The largest sized olive having been passed with but little resistance and no dilating bag being obtainable, bismuth, sandwiched between thin bread and butter was swallowed. The screen showed that most of this food passed at once into the stomach. The patient was now permitted to take solid food, which was swallowed without discomfort and did not regurgitate.

COMMENTS.

The thorny question of the exact pathology of the condition known as "cardiospasm" has been avoided deliberately. The practical point is that relief or cure can be obtained by instrumental dilatation. Time alone will decide whether, in the above case, the benefit derived is permanent.

The length of thread, fifteen feet, which sufficed to reach from the incisor teeth to the anus, is probably less than would be the length of intestine measured after its removal from the abdomen, since the thread would tend to lie against the mesenteric border of the bowel.

The use of the thread guide, whenever this can be swallowed (Plummer, in his large experience, found inability to swallow the thread to be a very rare occurrence) combined with the employment of a flexible sound, ensures the passage of instruments with a minimum of risk and discomfort. It is unnecessary to attach a shot to the end of the thread.

For diagnosis of the condition of the œsophagus, a skiagram is most helpful. The fluorescent screen enables the descent of the sound to be watched, and definitely settles the question whether the sound has, or has not, entered the stomach.

REFERENCES.

[1] Dunham: *Surgery, Gynæcology and Obstetrics*, Vol. 37, 1903, p. 350.

[2] Lockwood, C. B.: *Brit. Med. Journ.*, June 13, 1903, p. 1367.

[3] Mixter, S. J.: *Transactions of Amer. Laryng. Soc.*

[4] Plummer, H. S.: *Journ. of Amer. Med. Assoc.*, August 15, 1908, Vol. 51, p. 549.

[5] *Ibid.*, *Journ. of Minnesota State Med. Assoc. and North Western Lancet*, June 15, 1909.

[6] *Ibid.*, *Surgery, Gynæcology and Obstetrics*, May, 1910, p. 519.

[7] *Ibid.*, *Lancet*, January 15, 1912.

[8] *Ibid.*, A Paper on Cardiospasm, read before the American Surgica Association, June, 1912.

[9] Russell, J. C.: *Brit. Med. Journ.*, June 4, 1898, p. 1450.

◆

THE MANAGEMENT OF NEURASTHENIA, PSYCHASTHENIA, SHELL-SHOCK, AND ALLIED CONDITIONS.*

By FREDERICK C. FORSTER, M.R.C.S., L.R.C.P.

Bournemouth; late Resident Medical Officer, Royal United Hospital, Bath; Resident Surgical Casualty Officer, St. Mary's Hospital, London, etc.

In these strenuous times, when the nation's nervous system is strained as never before, when scores of our patients are showing the effects of nerve-tension in scores of different ways, it surely behoves us as far as possible to throw some light on the management of such cases, and, by discussion, to gather hints which, by being helpful to ourselves, may prove helpful to our patients.

Neurasthenia is a complex of symptoms induced by nerve exhaustion, and associated with, if not actually causing, an alteration in nutrition. It consists in the lowering of the nervous potential, and thus a neurasthenic is readily exhausted by ordinary efforts. Neurasthenia is rarely caused by physical strain alone, and nearly always due to a combination of mental overwork, anxiety, and worry, and it is the mental shock that accompanies a physical injury which gives rise to traumatic neurasthenia, or, as we have learnt to term it, shell-shock.

Psychasthenia is neurasthenia of a cerebral type. Serious physical injuries are not usually associated with neurasthenia, because the severity of the injury blunts consciousness; whereas much slighter injuries leave the sufferer's faculties vividly alive to the horrors and mental distress.

Neurasthenia may be of many different types, but the sufferers nearly always have in common certain symptoms, the most prominent being: depression, lassitude, often combined with a curious restlessness, insomnia, loss of power of concentration, failure of memory, headache, abnormal sensations in different organs, tremblings, dragging pains and palpitation, loss of appetite, and loss of vitality. They are all equally convinced that their complaint is unique, that some serious and mysterious condition remains undiagnosed, and that real recovery is not possible.

---

* Paper read at the Autumn Meeting of the Dorset and West Hampshire Branch of the B.M.A.

You all know, better than I can describe it, the picture of the neurasthenic, with his endless questions as to his protean symptoms, morbidly emotional and introspective, constantly worrying and over-estimating the importance of trivial things, and imagining the tachycardia from which he may suffer to be really some serious heart lesion. No class of case makes such demands on the patience and tact of the medical adviser.

It is essential to find out that the neurasthenia has not an organic cause, and to be certain that no concomitant disease has been overlooked, not merely organic disease of the nervous system, but definite disease of any organ; because neurasthenia is not a true neurasthenia, if it has a pathological cause.

Toxæmia, whether influenzal or gastro-intestinal, must be eliminated first of all, for the mental depression following on an influenza cannot be labelled or treated as a neurasthenia; neither is it the "good liver" who becomes neurasthenic, but rather the patient who breaks down under the strain of prolonged worry and anxiety. The following case illustrates the importance of accurate diagnosis:—

A gentleman, aged 45, was sent to me from London, where he had apparently broken down from financial worries and air-raid anxieties. I was asked to arrange for a nursing home here, and to undertake the rest cure. He had all the usual symptoms—insomnia, depression, dragging pains, palpitation, etc.—but, perhaps because one is naturally more careful and more thorough in examining a new patient for the first time, I noted a distinct area of tenderness in the epigastric and right hypochondriac regions. There was fixed tenderness and very definite rigidity over this area. A bismuth-meal X-ray showed the necessity for exploration, and the subsequent operation revealed extensive malignant disease of the duodenum.

The keynote of the management, I purposely use that term in preference to treatment, is to induce "self-forgetfulness," to do away with the inertia, to improve the *moral* by encouraging a feeling of independence, and to adjust the patient's life so that petty troubles and annoyances take their proper subordinate position, whether this is achieved by some wholesome and pleasant occupation, by drugs, or by some of the many other methods which you will discuss.

Neurasthenia, like most other diseases, varies in degree, acute, subacute, mild, and chronic. In the acute stages (and these may almost border on the mental) a suitable nursing home is imperative. All nursing homes are *not* equally suitable for these cases, for the personality of the nurse is just as important as that of the medical attendant, and further, what I would like to designate "the personality of the room occupied" is equally to be considered. There, the Weir-Mitchell or rest cure can be begun. Apart from the dieting, and in this connection the question of vitamines and accessory food factors is of special interest, the chief essential is to procure sleep for the patient. For this, massage in the evening is sometimes, but not always, helpful, and the precise kind of massage is important. It must be gentle and soothing, effleurage or some of the softer stroking movements. A pack and a warm bath are useful adjuncts, and we realize that these patients rest better in a sedative rather than a bracing climate.

It is important to instruct the patient, when resting in the daytime, to cut off perception by keeping the eyes closed. The value of this is seen on any long railway journey, which is much less tiring if the eyes are shut so that there may not be the great mental strain caused by constantly taking in fresh pictures.

If drugs must be used, I prefer chloralamide to either paraldehyde or the bromides, whilst, for the general excitation, I have found monobromated camphor with conium useful.

As soon as the acute stage has passed off, usually in a week or two, it is inadvisable to prolong the Weir-Mitchell treatment. The course usually prescribed is six weeks, but this is, in very many cases, harmful. Apart from the expense, the worry over the financial aspect of the illness will not help a neurasthenic to recover, the *ennui* and monotony are prejudicial, and will engender a feeling of helplessness, feebleness, and dependence upon others.

In certain cases, it may be necessary to carry out the full six weeks' course, but I believe the majority would be far better to begin in a fortnight or three weeks to interest themselves in some pursuit or hobby, such as basket-making, carpentry, bookbinding, flower-pressing, pottery-making, gardening, or natural history, or some of the milder forms of sport, such as fishing.

It is an interest in *life* that these people need. This will prevent them from drifting into the chronic stage from which it is so difficult to remove them. It is at this stage that tonics, physical, psychical, and mental, may be of the greatest use.

Drugs of many kinds, though for the most part better avoided, are employed. Strychnine, arsenic, iron, phosphorus, which is best given in the form of lecithin (a natural phosphoglyceride), the valerianates, the glycerophosphates and polyformates, the malt preparations with and without cod-liver oil, ichthyol, which is of real value in the psychasthenic vasomotor neuroses of the menopause, and the various organic extracts, didymin, spermin, etc.

Suggestion, auto-suggestion, and, in certain selected cases, hypnotic suggestion are of undoubted value, and hydrotherapy has its advocates, whilst, as regards electrical treatment, I (although not an expert) consider that static electricity is more applicable to cases of pure neurosis, and that high frequency is more suitable to cases of high tension with deficient metabolism, though probably the benefit of either is enhanced by the potent " suggestion effect " of the method used. Finally, there is that advice so often given : change of air, scene, and climate.

Regarding this change of air, scene, and climate, I take it that what is broadly meant is change of environment, and I would like to throw out the suggestion that, though it is not always possible to change the physical environment, yet much—very much—can be achieved by altering the mental or psychical environment, and the power of creating a special mental environment is so helpful in turning what is repulsive into what attracts.

Things which are repellant when we happen to be worried, will please us as soon as the worry is removed. We are all familiar with the expression, " Oh ! Doctor, I cannot enjoy my food. I am too worried and anxious about so-and-so."

Thus, when the physical environment is not quite satisfactory, one may alter the mental attitude towards the physical situation, and so create a new aspect and a more favourable mental environment. However, I will not labour this point, in case we become involved in a psychological, philosophical, or even a metaphysical discussion.

In neurasthenia particularly, it is the person rather than the disease that demands treatment, and therapeutics is an art which does not lend itself to generalization, but, to be really effective, must deal in detail with the minute disturbances of health.

I will not recite cases from my note-books, these are chiefly of interest to the patients and myself, but I will mention one which illustrates some of the points which I wish to emphasize.

In 1915, a young lieutenant in a Scottish regiment, attached to the Royal Flying Corps, met with shell-shock. He had landed when a shell destroyed his machine, and, though himself unhurt, he had vague recollections of anything until he found himself, three days later, in one of the base hospitals suffering from shell-shock. After some weeks, he was transferred to England to an officers' hospital. Two months later he was sent to a special hospital for nerve disorders, whence, a month later, he was sent on to an officers' convalescent hospital. All this time he was steadily going downhill. Then a nursing home, with six weeks' strict Wier-Mitchell, was advised. Finally, he was invalided out of the Army as not fit for any further service, and sent down to his relatives who live here. When I saw him, his condition was pitiable. Wasted and racked with insomnia, alternating with terrifying dreams, he had quite lost all hope of getting better, was a prey to all sorts of vague terrors, and imagined that he was the victim of most of the diseases he had ever heard of. Afraid to be left alone, with no confidence in himself and very little in others, his chief recreation was to read through the stacks of prescriptions which he had accumulated in the previous six months.

It was obviously no use in a case like this to recommend a return to any of the already-employed treatments, whether rest cures or otherwise. The first thing to do, apart from impressing him that he *would* get absolutely cured, was to restore his confidence in himself, and to prove to him that he *was* capable of some sort of work, and so make him increasingly dependent upon his own efforts. I found a suitable occupation for him, and made him depend for the necessities of life on his own work and efforts, aroused his interest in his gradually increasing independence, and, to cut the story short, he got perfectly well and rejoined the Army last February.

It was with much interest and not a little pride, that I noted a few months ago that he had received the Military Cross for a particularly daring reconnaissance into the German lines.

What I wish to emphasize is that a much earlier return to an occupation, or work of some sort, not necessarily the previous work, will be far more beneficial to very many neurasthenics than the prolonged stereotyped rest cures in a nursing home, where the whole atmosphere engenders a spirit of dependence on others rather than on themselves.

One realizes that the personal element and the factor of suggestion cannot be eliminated entirely, but the majority of these cases which recovered perfectly had previously tried all the usually recognized forms of treatment where these same factors were presumably existing.

Have we not learnt the value of early movement and massage in cases of sprains and fractures, and discarded the prolonged use of splints, and, in consequence, do we not notice the absence of stiffness and weakness due to chronic adhesions? Can we not, in all sweet reasonableness, apply this in cases of wearied and worried nervous systems?

CLINICAL NOTE ON TREATMENT OF WHOOPING COUGH BY VACCINES.

By WINNIEFRED M. GRAY, M.A., M.B., D.P.H.

Late R.M.O. City Hospital, Fazakerly, Liverpool.

During the last two and a half years, I have been trying the effect of a vaccine in the treatment of pertussis. Having found the results so satisfactory, I thought a few notes might be of interest to those who undertake the domiciliary treatment of whooping cough or to those interested in the reduction of infant mortality, which pertussis, with its complications, tends to raise.

I have employed three different vaccines, either alone or with the addition of drugs such as antipyrin, belladonna, bromide, or garlic, and have found that the cases treated with vaccine have shown decided improvement after the injection. The first vaccine I used was the stock preparation of Parke, Davis & Co., which contains 250 million Bordet's bacilli, and 10 million pneumococci, per cc. The second was one which I had had prepared by the same firm, and contained 250 million Bordet bacilli per cc. without the addition of any pneumococci, and this is the preparation which I found most satisfactory in reducing the paroxysms, lessening the vomiting, and tending to the most rapid recovery with disappearance of the characteristic whoop. The third vaccine was the "pertussis vaccine" supplied by the New York Health Department. This I was able to use in only six cases; but I did not find the results so satisfactory as in the case of vaccine No. 2. This may be due partly to the preparation not having been so fresh, and partly to the small number of cases on which I had the opportunity of testing its value.

All those to whom I administered this treatment were in-patients in different hospitals, and were, for the most part, very debilitated, badly nourished, underfed children of six years and under, so the results are all the more worthy of note.

During the year 1914–15 the chief line of treatment which I adopted, in addition to fresh air, good food and other hygienic methods, was the employment of the usual sedative drugs, bromide, belladonna, antipyrin, etc.; but, in spite of every care and attention, the paroxysms did not seem to get any less frequent, and the disease ran its own course, which was generally a prolonged one, accompanied in many cases by a more or less severe broncho-pneumonia. The first time I employed vaccine No. 1 was as a last resource, and the result in this case was so striking that I resolved to try it on further cases of whooping cough. In all, over thirty cases had vaccine injections, and a night and day chart was kept, on which were registered the date of vaccine administration and the number of times that the cough, whoop, vomiting, or blood was present; the records showed a gradual decrease in the symptoms corresponding with the vaccine administrations. The few cases which did not respond well to the vaccine came to hospital in a condition too feeble to give any reaction except a negative one, or were complicated by some intercurrent malady such as tuberculosis or some superadded infectious disease.

Date.	Vaccine.	NIGHT.				DAY.			
		Cough.	Whoop.	Vomit.	Blood.	Cough.	Whoop.	Vomit.	Blood.

An interesting note was made of the case of two sisters admitted the same day. The one received an injection on the third day after admission, and the other had none till a few weeks later. They both had sedative cough mixture from the time of admission, but there was no steady improvement till after the vaccine had been employed.

CASE 1.—F. R. (five years old), admitted on May 3 with a history of whooping cough of one month's duration. On May 4, T., 102·4; P., 144; R., 32. During the night the child had a troublesome cough with definite whooping. The pulse was very poor, and adrenalin chloride 1–1,000 was given. Vomiting, whooping, and coughing continued during the next day, and on the following day, May 6, 1 cc. of vaccine was given. Cough, vomiting and whoop, though less severe, continued, and, on May 11, 1 cc. was again given. By May 25 the broncho-pneumonia was clearing, and there was only an occasional whoop, without any vomiting or blood. From that date there was no recurrence of symptoms, and the child was discharged quite healthy on June 21.

Case 2.—M. R. (sister of Case 1, aged three years). Admitted May 3, with history of whooping cough for fourteen days previous. On admission, T., 103; P., 146; R., 32, with pronounced cyanosis, capillary bronchitis, vomiting, whooping, and blood-stained sputum. The temperature varied from 98°·4–100°, and for some time there seemed to be an improvement in the condition, but, on May 25, the child was not so well, and all the symptoms of pertussis became more active. On June 1, the first dose of vaccine was given, and during the next few days there was evident amelioration of the condition. The injection was repeated on June 6; and by June 9, apart from an occasional cough, all the characteristic symptoms of pertussis had disappeared, and the child was discharged along with her sister on June 21.

Case 3.—E. M. (aged five years), admitted May 24; history of whooping cough for fifteen days previous. On admission, there was whooping, vomiting, cyanosis, and broncho-pneumonia; T., 97°; P., 138; R., 32. The vaccine was injected on May 24, and there was gradual improvement; but the whoop, though less frequent, continued till June 1, from which day till date of discharge, July 15, there was no evidence of whooping cough. This patient had no treatment apart from vaccine.

Case 4.—L. K. (aged three and a half years), admitted September 19, six days after commencement of whooping cough. There was frequent whooping and cough during the night, and broncho-pneumonia was present. On September 20, 1 cc. vaccine was given, and this was followed by a slight increase in the paroxysms, and blood appeared in the sputum. The vaccine was repeated on September 26, and was followed by some improvement. On October 3, a third injection was given, and the condition showed more definite improvement; and, by October 13, the chest was clear, and there was only an occasional cough. When the patient was discharged on October 18, there had been no whoop nor vomiting for twelve days.

These are just a few notes on some of the cases in which the various vaccines were employed, but I think that more interesting facts could be obtained by keeping a bacteriological as well as a clinical record while using vaccine injections in the treatment of whooping cough.

GESTATION PROLONGED TO TWELVE MONTHS.

By J. T. ROGER MILLER, M.S.A., L.M.S.S.A. Lond.; L.M.R.C.P. Irel.

THE recent decision in the High Courts of Justice, in which the petitioner denied paternity of a child on the ground of gestation being prolonged into ten months, lends peculiar piquancy to the following case which occurred quite recently in my own practice:

Mrs. N—, M², aged 28 years, consulted me as to her condition on May 6, 1916, when I found she was suffering from persistent leucorrhœa, sickness, and cessation of menses since February 12, 1916. No marital relations had taken place since before the last menstrual period. On examination and questioning, I found that she was distinctly pregnant, for the second time, and that such pregnancy had advanced three months. I calculated that normal delivery should take place about November 19, 1916, and was booked for that date. I attended her for some time for the local discharge, and as her husband had been called up to the Forces, no marital relations took place during this period. On November 19, 1916, I was sent for, as labour pains had begun fairly strongly, and a discharge of liquor amnii had taken place. On examination, I found the os dilated to the size of a shilling and the vertex presenting. Pains were very slow—15 minutes interval—and of short duration. These continued for just over 24 hours and then entirely ceased. The case dragged on slowly to my great surprise and anxiety, until at last, on February 11, 1917, labour definitely set in, and she was delivered of a healthy female child on February 12, 1917, after a very tedious labour which was terminated by forceps, and after twelve months' cessation of menses and undoubted pregnancy, for no marital relations had taken place since just previous to February 12, 1916. Recovery was slow but good. Fœtal movements during the last three months were very feeble.

I have been engaged in midwifery practice now for over thirty years, and have never come across a case like this. Dr. Playfair, in his *Treatise on the Science and Practice of Midwifery*, Vol. I., page 178, quotes four cases in which pregnancy extended, respectively, into 336, 332, 324 and 319 days, so that if pregnancy can and has extended for that length of time, it is certainly quite feasible for it to extend another 29 days.

Practical Notes.

ASTOR OIL FOR DRESSING WOUNDS.

Revillet, in charge of an auxiliary hospital at Cannes, draws attention to the usefulness of castor oil in dressings for wounds. It has the following advantages:—

1. It never gets dry, and gauze impregnated with it never sticks to the wound, even after a long time, and however seldom the dressing is changed; 2. Its characteristic oiliness makes the introduction or the removal of gauze drains very much easier into fistulæ or openings into abscess cavities. This detail is, consequently, carried out without causing pain, and time is saved because there is no need to loosen the dressing by irrigating; 3. Its property of dissolving alcohol, alcoholic extracts, tinctures and essences in such a way that the products, mixed with the oil, remain completely dissolved and do not precipitate. This property has been made use of for many years on the Riviera in the manufacture of perfumes. Revillet recommends the following prescription as the result of repeated trials:—

Essence of thyme	40 cc.
Essence of lavender	40 cc.
Essence of eucalyptus	40 cc.
Castor oil	1 litre.

This mixture has a very penetrating and agreeable odour, and deodorizes at once the most infected and nauseous wounds. It causes no local irritation and no dermatitis. It has a considerable antiseptic effect, which is shown by the quick decrease in the amount of pus, which becomes thick and creamy. It has a decided effect on the B. pyocyaneus. The dressings are prepared by soaking the gauze or dressing material used in the solution, and then placing it in wide-mouthed bottles which are hermetically sealed by a rubber cover. They are then sterilized in boiling water for an hour and a half. This is preferable to placing them in an autoclave, because, the temperature not being so high, there is less evaporation of the essences, and the bottles themselves cannot resist the high temperatures of the autoclave.—(*Journ. de Méd. et de Chir. prat.*, October 10, 1917.)

TREATMENT OF SALONIKA MALARIA.

In a recent communication to the *Académie de Médecine*, Marchoux stated that the malaria at Salonika is due to the three known types of Laveran's hæmatozoon. The most practical conclusion in the communication was the fact that, in agreement with other writers, it appears that too great importance has been attributed to hypodermic and intravenous injections of quinine. It is a disadvantage for the drug to be eliminated from the system too quickly, and this is found to be increased when very soluble salts are used, especially if these are given by hypodermic or intravenous injection. Trousseau pointed out the superiority of quinquina over quinine, and the reason is doubtless to be found in the slow absorption of the alkaloids. Marchoux found that sulphate of quinine was more effective than the more soluble salts, and that basic quinine is to be preferred to the sulphate; the hydrate contains 85 per cent. of quinine, and the sulphate 72 per cent.

Hypodermic and intravenous injections are not free from dangers, and ought to be reserved exclusively for the treatment of malignant attacks which require speedy intervention. In chronic malaria, the drug should be given by the mouth, in the least soluble form possible, and basic quinine is perfectly suitable.—(*Journ. de Méd. et de Chir. prat.*, October 10, 1917.)

IODIDE OF STARCH FOR INFECTED WOUNDS.

Lumière, of Lyons, carried out a large number of experiments *in vitro*, and then on animals, to obtain an actively antiseptic application, which did not combine with albuminous substances, as the majority of these do. Their disinfectant properties are accordingly lost altogether in the course of a few minutes after application, so that constant renewal is necessary, and this requires rather a complicated apparatus. The problem was to find a substance sufficiently stable and thoroughly active, which would not be inactivated by the tissues, and could keep its effect for several hours, or even several days. His experiments *in vitro* showed that iodide of starch gave remarkable results. In a strength of iodine corresponding to 1 in 50,000, it was able, after an exposure of 24 hours at 37° C., to kill the streptococcus, B. pyocyaneus, and B. coli. The staphylococcus was unable to resist solutions containing ten times less of the active substance. Artificially infected wounds in animals were then treated with the iodide of starch, both in powder and in gelatinous solution. It was found that these were disinfected very rapidly. Lumière thereupon made use of the substance in gunshot wounds of the soft parts, which were open and free from sinuses and deep pockets inaccessible to the antiseptic. Starch can fix from 18 to 20 per cent. of iodine, but this strength was too irritating for use. It was found that a strength of about 1 per cent. was quite sufficient for all purposes. It is also possible to use the iodide of starch in solutions suitable for irrigation purposes, by Carrel's method. For this the following solution is prepared:—

Soluble starch - - - - -	25 g.
Solution of iodine 1 per cent. in potassium iodide	50 cc.
Boiling water - - - - -	1,000 g.

One litre of this solution contains 0·50 g. of iodine in such a state of minute subdivision that it passes through a filter-candle. It is quite unirritating, equal in effect to Dakin's solution, and does not spoil the bed linen, etc., which suffer quickly and severely from the hypochlorite. Healing is obtained very speedily indeed.

Reviews of Books.

Clinical Bacteriology and Hæmatology for Practitioners. By W. D'Este Emery, M.D., B.Sc. Fifth edition. Pp. xxxiv + 310. 11 plates and 55 illustrations. London: H. K. Lewis & Co., Ltd. 9s. net.

Dr. Emery is an acknowledged master of his subject, and has the added advantage of being gifted with the faculty of lucid explanation. The general approval, which he modestly claims for his book, is more than justified, for it is extremely popular with all who work, on a large or a small scale, at this fascinating and useful branch of knowledge. The instruction afforded is so plainly set forth that the book may be said to be really indispensable for everyone wishing to acquire a sound practical experience in the subject. The new edition will be received with a warm welcome in all laboratories, although the book still remains, as it was intended to be from the first, one for the practitioner rather than for the advanced worker. The additions made in this new edition are beyond its original scope, and will be more useful to the latter than to the former, but they have involved no alteration in the plan of the book. We are sorry to notice that some of the old illustrations, or rather the blocks for these, have not made a cheerful response to the fresh call upon their services.

Three Clinical Studies in Tuberculous Predisposition. By W. C. Rivers, M.R.C.S., D.P.H. 8vo. Pp. 272. London: Geo. Allen and Unwin.

Dr. Rivers has written three interesting essays in which he argues that pulmonary tuberculosis is closely connected with three conditions that do not appear at first sight to have any bearing on it. One of these is ichthyosis of the skin; he produces good reason for supposing that the existence of ichthyosis may entail a liability to consumption, and goes further to argue that this predisposition may possibly sometimes be hereditary too, just as ichthyosis itself is. The next condition considered by Dr. Rivers is squint; his observations show that the ordinary concomitant squint is two or three times as common in consumptives as in the general population, and he holds that squint is a sign of predisposition to pulmonary tuberculosis. The third condition connected with consumption is nasal abnormality, or nasal obstruction. Most of the volume is devoted to the development of this thesis, and to a tabulation of the observations upon which it is based. Dr. Rivers writes with a most persuasive pen, and carries his readers with him. His three main contentions, indicated above, are based on his own observations, and must be tested by the statistical analysis of clinical observations collected over the widest possible field. His book will be read with interest by many medical practitioners.

A Manual of Surgical Anatomy. By Lewis Beesly, F.R.C.S., and T. B. Johnston, M.B., Ch.B. Pp. 538. London: Henry Frowde and Hodder and Stoughton. 12s. 6d. net.

As the preface explains, this book is an attempt to give to the student an incentive to study surgical anatomy in the dissecting room. The authors were for many years well-known demonstrators of anatomy in the University of Edinburgh, whilst one of them is a surgeon of note; it should, therefore, follow that, in producing a new work, they have attempted a task which they are peculiarly well qualified to bring to a successful conclusion. It is satisfactory to note that the anatomy of the region round the juxta-epiphysial line is carefully considered in its bearing upon the production of bone and joint disease. The almost entire omission of the amputations of the limbs need not be regretted.

We would suggest at once the leading feature of the book is the remarkable consistency in the high level attained by the illustrations, most of them in colour. Many are borrowed from Cunningham's works on anatomy. The drawings of the joints are probably the best we have seen in works of this kind. The purely surgical part of the book might quite well be criticized on the grounds that too much preference is given to Scottish methods to the exclusion of others, perhaps more usual in the rest of the country.

We would enter a protest against the scant acknowledgement of so important an anatomical fact as the pouches of Barnard in the knee-joint.

The origin, connections, and distribution of the special nerves are very well shown in a series of excellent diagrams.

We believe this work may be classed very high in the long list of books on surgical anatomy; the text is very clear and unusually precise. There is an enormous amount of material in the book, and it is difficult to see how it could be reduced in any particular without gravely risking its value to the student. A full knowledge of the contents would certainly equip any man for the highest examinations in this subject.

The authors are to be congratulated very highly on a most successful venture.

The Treatment of Tuberculosis by means of Spengler's Immune Bodies (I.K. Therapy). By Niven Robertson, M.D., D.P.H. Cr. 8vo. Pp. xiv + 152. London: Baillière, Tindall, and Cox.

Dr. Niven Robertson of Benenden Sanatorium has written an excellent account, both theoretical and practical in its scope, of the treatment of pulmonary tuberculosis with Carl Spengler's I.K.

This substance consists of the acidified blood of rabbits that have been immunized against tuberculosis in general by means of injections of various types of tubercle bacilli and streptococci. It is not, therefore, of the tuberculin type, but contains immunizing substances, not toxins. The tuberculins are for use in the case of patients with some powers of resistance to the invasion by the tubercle bacillus. Spengler's I.K., contrariwise, is indicated for patients with a very low power of resistance, advanced cases of phthisis, and those who are too sensitve to tuberculin. Tuberculin treatment is believed to do good by increasing the patient's active immunity alone; I.K. imparts a passive as well as an active immunity to tuberculosis. Such, at any rate, is the hope; Dr. Robertson remarks that his own results with I.K. have not been striking, yet have not discouraged him from trying it further, and have increased his desire to get other clinicians to try it. He gives a full description of both the theory and the practice of I.K. theraphy with details of his use of it in 41 cases. Some account, too, is given of the reports of 16 authors who have got good results, 11 whose results have been indifferent, and 8 whose results with I.K. have been definitely bad. Dr. Robertson classes himself with those who regard it as of doubtful value as a specific remedy.

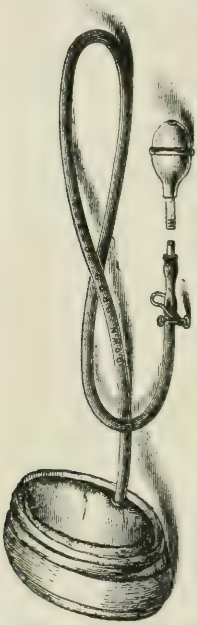
Clinical Tuberculosis. By F. M. Pottenger, A.M., M.D., LL.D., 8vo. Two vols., pp. 708 + 714, with illustrations, charts, and coloured plates. London: Henry Kimpton.

In these two massive tomes, Dr. Pottenger has endeavoured to set out the observations he has made in twenty years of clinical study, for the most part in his Californian sanatorium. The book deals almost entirely with pulmonary tuberculosis, and its complications; thus, tuberculosis of the bones and joints is dismissed in less than a page, and the title chosen for the book might well have been "Pulmonary Tuberculosis." The first volume deals with the pathological anatomy, the pathological physiology, the diagnosis, and the prognosis in consumption. The second volume contains an account of the chief complications and the treatment of the disease, and at the end has a chapter, 140 pages in length, called "The Tuberculosis Clinic," in which Dr. Pottenger discusses a number of illustrative cases. The author of these two imposing volumes is known as a laborious and painstaking clinician with great experience in the subject with which he deals, and the publication of the observations he has made and collected in them will add to his reputation. He writes in a diffuse and even pedestrian style, and it is clear that he is not unacquainted with much of the literature of the subject. His views on pulmonary tuberculosis and its treatment may be described as conservative and eminently sound; his two volumes contain a great deal of valuable information and many valuable hints that should be of the greatest service to medical practitioners of all sorts who have to deal with pulmonary tuberculosis.

Preparations, Inventions, etc.

A PNEUMATIC TOURNIQUET, FOR AMPUTATION, TRANSPORT OF WOUNDED, ETC.

(London : Messrs. Down Bros., Ltd., St. Thomas's St., S.E.1.)



This tourniquet has been made at the suggestion of Capt. J. V. Fiddian, R.A.M.C., and is suitable for amputations and arrest of severe hæmorrhage from the limbs. It has two additional advantages: it is easily sterilized, and can readily be controlled by an anæsthetist, when standing at the head of the patient, for the bag has a sterilizable cover, and an inflating tube about 4 feet long. To this is fitted a bulb with a valve similar to that of a Riva Rocci apparatus, and a spring clip. The bag has a lead back to prevent "rolling" on inflation. In use the bag is wrapped round the limb with the tube towards the patient's head, and a 2½-in. linen bandage is firmly applied over the tourniquet, which is then inflated until the distal pulse disappears. In amputation, after all bleeding points have been secured, the anæsthetist can release the pressure by opening the valve, pumping up again if bleeding reappears. When there are brittle arteries, there is less risk of damage with this tourniquet than any other, for the pressure is only just enough to compress the artery, and when the artery has been tied, it can be released at once. To guard against hæmorrhage when carrying the wounded, the bag and bandage can be put in position ready for immediate inflation, in case of need. If bleeding occurs, it is then only necessary to inflate until it stops; a comparatively inexperienced person can be entrusted with this duty.

COCOA, COCOA AND MILK, ETC.

(Bournville : Messrs. Cadbury Bros., Ltd.)

The usual samples from Messrs. Cadbury bear a rigidly businesslike appearance this year, for Bournville Cocoa, Cadbury's Cocoa Essence, and Cocoa and Milk constitute the assembly, and for this the war conditions are, of course, responsible. We must express our appreciation of the reliable nutritive value of the preparations mentioned, especially the last named—Cadbury's Cocoa and Milk. This is a real food in itself, and its mode of preparation is so easy —boiling water only being required—that it represents a distinct addition to present-day economies.

THE PRACTITIONER.

FEBRUARY, 1918.

THE VALUE AND LIMITATIONS OF SANATORIUM TREATMENT FOR TUBERCULOSIS.*

BY SIR STCLAIR THOMSON, M.D., F.R.C.P., F.R.C.S.

President of the Medical Society; Professor of Laryngology in King's College Hospital; Laryngologist to King Edward VII. Sanatorium, Midhurst.

> "*A wholesome taste for cleanliness and fresh air is one of the final attainments of humanity.*"—John Ruskin in *Time and Tide*, Letter V. February 25, 1867.

WE have devoted no less than three entire evenings to discussing the treatment of a disease which causes one-third of the total mortality during the chief working years of life, which is the greatest cause of disablement and mortality in adult life, which kills 53,000 individuals annually in England and Wales, and which has on its sick list in these islands from a quarter to half a million of the inhabitants every year.

The economic loss to the country, directly and indirectly, is difficult to estimate, even approximately, but anyone can see that it must run into millions of pounds per annum.

Instead of declining, as it had been steadily for many years, the death-rate of tuberculosis is rising. In 1916, it showed an increase of 12 per cent. on pre-war figures, and in a city like Newcastle-on-Tyne the death-rate from this disease in 1916 was 25 per cent. higher than in 1913, and there are signs of continued increase. (*See* Fig. 1, page 109.)

We have, therefore, done well to re-consider one side of the complex question of tuberculosis, and our Society has been exceptionally fortunate in hearing the sanatorium question considered as it regards the well-to-do (Dr. David

---

* The summing-up of a discussion before the Medical Society of London on November 12, 19, and 26, 1917, specially revised and rewritten for THE PRACTITIONER by the author.

Lawson), the middle classes (Dr. Noel Bardswell), and the working classes (Dr. Wilfred O. Meek), by men who are experts in these matters, and also discussed from many points of view by both medical men and lay men.

There is a Sunday paper which gives a list of the "sayings of the week." Sitting in this presidential chair, I have jotted down some of the sayings of the three nights' debate, and here they are—

"My firm opinion is that sanatorium treatment was, without doubt, the best, not only in the interests of the community but, in properly chosen cases, also of the individual patient."—*Sir R. Douglas Powell.*

"Sanatorium treatment was the best we had."—*Dr. Latham.*

"Firmly convinced of the great value of sanatorium treatment."—*Dr. F. R. Walters.*

"Invaluable and indispensable in the treatment of certain forms of tuberculosis."—*Dr. Camac Wilkinson.*

"No one can deny the value of it."—*Dr. Henry Ellis.*

"The best method of raising resistance which we have at present."—*Dr. Nevin Robertson.*

"The only treatment."—*Dr. Crace-Calvert.*

With such a cloud of witnesses, so unanimous in their verdict, although viewing the subject from somewhat varying points of view, we may regard the intrinsic value of sanatorium treatment as well established. We should hear no more nowadays of such opinions as that of the physician of a great London medical school, who was quoted by Dr. T. D. Lister as saying that "a sanatorium was a very suitable place for consumptive paupers and fools!" If this was meant as a "somewhat humorous dictum," it was sadly out of place in the mouth of a "senior lecturer on medicine," charged with instructing students in regard to the best treatment we have for one of the chief scourges of humanity. If the lecturer on medicine was serious—well, he is still eligible, even under his own indications, for admission to a sanatorium, where he may be converted to some of the principles of the hygienic life, and learn that we have no better system of raising resistance, not only against tubercle but against many of the ills of our brittle life.

So much for the intrinsic or potential value of sanatorium treatment. What have we learned of the limitations and, consequently, of the general value? We may consider this under the headings of—

1. Early Diagnosis,
2. Selection of Cases,
3. Length of Stay in the Sanatorium,
4. After-care,
5. Aids,
6. Alternatives: Home Treatment,
7. Infection and Environment.

I.—EARLY DIAGNOSIS.

Every speaker—I do not think there has been a single exception—has pleaded the importance of early diagnosis. "Early diagnosis, early speaking out, and adequate early treatment" were of urgent importance, said Dr. J. J. Perkins, and he went further and said that we should send "not only patients with tubercle bacilli in the sputum to sanatoria, but especially the cases of early hæmoptysis, the tubercular pleurisy, and the cases of progressive emaciation and debility, with some pyrexia but few physical signs." Dr. Meek said that "not only recognition of initial symptoms is all-important in the case of the working man, but supervision, advice, and warning in the really incipient stage." "Delay in sanatorium treatment was fatal to success," said Dr. Henry Ellis, "and yet we had waiting lists!" "Sanatoria," said Dr. Hector Mackenzie, "should be reserved for early cases."

Henceforward, I trust that no medical man will tell a patient, with these warning or incipient symptoms, that "his case is not bad enough for a sanatorium." Dr. Hector Mackenzie said that these early cases were not often met with in practice, and while it is true that this protean disease is sometimes so insidious that it is well advanced before it occurs to a patient that there is something wrong with his health, and while we know that the working man does not reckon himself ill so long as he can keep at work, still, I must confess, that intimate association with sanatorium life and work has shown me that in quite a good many cases an early diagnosis has not been made through neglect on the part of the medical men—a neglect in some cases due to want of care or want of imagination, while in others the oversight was caused by the hurry of overwork. Now that cases of tuberculosis are becoming less and less frequent in our clinics, and the wards of our general hospitals, I fear our future students will be still less likely to detect the early cases. The only way to correct this will be to insist on the curriculum including some weeks, at least, of residence and study in a sanatorium.

2.—SELECTION OF CASES.

The suitable cases were indicated by Dr. F. R. Walters in one of the most concise definitions I have ever read. He pithily described them as "those with limited lesions, only moderate constitutional disturbance, no serious complications, originally fairly good constitutions and without history of massive or virulent infection." It was also pointed out that the treatment cannot always be reserved for those with limited lesions; the patient's reaction to treatment, his powers of sleep and digestion, and his proneness to pyrexia, may have as much importance as his physical signs in gauging his suitability for a sanatorium. The mentality of the patient is also of great importance. It is difficult to cure a fool of tubercle. From his extensive and close personal association with consumptive patients, Dr. Meek tells us that there are cases unsuitable on grounds other than medical. There are a number of individuals, he said, whose treatment is foredoomed to failure on account of their habits, lack of will power, or intelligence. Though they may be excellent subjects upon the grounds of selection, and though they may make a good immediate response to treatment, they relapse quickly upon discharge. People with these characteristics are likely to have them rendered more pronounced, if their treatment is gratuitous or given from public funds. Their mentality may only be revealed after a period of observation in a sanatorium. This fact gives the sanatorium medical officer a great advantage over the physician or the family doctor, and it is one reason why the sagacious medical superintendent will not give a prognosis until he has had a patient under daily observation for a week or two.

It may be news to some of us that, according to Drs. Lawson, Meek, and Ellis, the patients coming from a poor environment,—*i.e.*, the labouring classes, respond sooner and better to treatment than those who have contracted the disease in a good *milieu.* The working man develops the disease because he is badly fed and housed; he picks up at once when put into healthy surroundings. But the well-to-do man gets consumption in spite of a good table and a good house; to him, therefore, the sanatorium brings no great change in material conditions and his improvement is therefore slower. But this disadvantage is, as Dr. Lawson has pointed out, balanced by the fact that the wealthy patient can remain longer in a sanatorium, he can return there in the event of any threatened or actual relapse, and he is free from financial anxieties both during and after his stay.

3.—LENGTH OF STAY IN A SANATORIUM.

The value of sanatorium treatment is largely dependent on the length of time spent there. We have heard in the course of this debate that residence in a sanatorium should be "much longer than it usually is for every class of patient" (Dr. T. D. Lister). "In all but the really incipient cases, two or three months is a quite inadequate period" Dr. Meek tells us, and he adds that some months at least should be passed under sanatorium conditions after the stage termed "arrest" has been reached. I would here recall the dictum of Dr. J. J. Perkins that treatment should be "early, thorough, and prolonged." As one of the results of this debate, let us hope that we will hear no more of the foolishly optimistic opinion too often given to a patient with open tubercle that "two or three months in a sanatorium will put you all right." The value of even a short residence in a sanatorium, as an education in self-management, is another matter.

4.—AFTER-CARE.

The value of a course of treatment is largely contingent on what happens to the patient when he leaves the sanatorium, and the neglect of this in the past explains why Dr. Lister is depressed with the after-history of sanatorium patients, even when discharged from institutions as "arrested." Dr. Bardswell sounds a very important note, which everyone, and particularly our statesmen, should listen to, when he says that "the critical time begins when the sanatorium is left. Success or failure is determined during the next two or three years." Statistics confirm the truth of the important observation that the two years following discharge from the sanatorium are "of supreme importance." They also support the contention that, with proper after-care during this time, much better results will follow on the sanatorium course. Thus, Dr. Meek found that, of carefully selected cases discharged from Frimley, 9·8 per cent. died in the first year, 21·6 per cent. in the second year, and that at the end of the fifth year, 46·6 per cent. were dead. Even if they leave with the sputum free of tubercle bacilli, 9 per cent. die before they have been out three years; *i.e.*, if they return to ordinary working conditions. On the other hand, in a similar but not quite such a good group (for 23 out of 44 still had T.B. on leaving) who left for somewhat better work and surroundings, only 2·3 per cent. had died after the same lapse of time.

Surely it is this defect in after-care which accounts for Dr. Meek's conclusion that the results of sanatorium treatment in the working classes are "far from satisfying," and makes Dr. Ellis say that "from a national point of view, sanatoria were a failure." The suggestion to shorten the hours of work or take long week-ends is only applicable to the middle and upper classes. If the teacher, the clerk, the secretary, the tradesman, the shopman, the factory hand, the housewife, or, in fact, any indoor worker, returns to unhealthy houses, habits, and haunts, his resistance will be lowered before arrest is consolidated. The working man's only capital, as Dr. Meek wisely points out, is, as a rule, his capacity to perform continuously a full day's work. This is impossible for some time after leaving the sanatorium. Yet, as Mr. Bowerman, M.P., told us, very few patients, in any walk of life, can or will change their environment and occupation; and the willing ones may spend two to three months in a state of semi-starvation looking for work at a time when good food and care are most required (Dr. B. A. Richmond). In one way or another the after-care, which is so necessary a pendant to the sanatorium, must be arranged for, otherwise "a sanatorium visit of only a few months does little to justify the expenditure of large sums of money" (Meek).

5.—AIDS IN SANATORIUM TREATMENT.

Have we learned anything of the aids to sanatorium treatment? I think we can say very little, chiefly because this part of the question was outside our terms of reference. Still, I might draw attention to Dr. Lawson's recommendation of artificial pneumothorax as a means of stopping hæmorrhage, or in bringing about arrest in localized acute disease. During his 11 years' work as superintendent at Midhurst, Dr. Bardswell has tried nearly all the aids, from tuberculin and vaccines to chloride of gold. He has not observed any benefit from them. It is worth recalling that, of all the remedies he has tried, he would still prefer the old Brompton Hospital mixture of soda and gentian with a dash of nux vomica and the liquid extract of cascara!

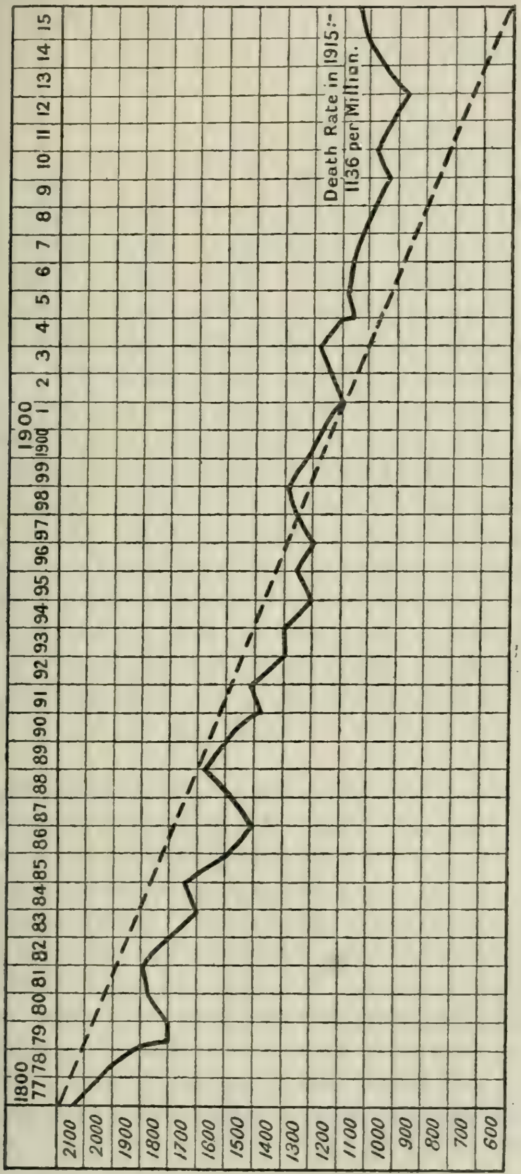
6.—ALTERNATIVES TO THE SANATORIUM COURSE: HOME TREATMENT.

With reference to substitutes for sanatorium treatment, we have heard enough evidence to persuade us that they are all inferior. Sir Arthur Newsholme did certainly say that patients often did very well in huts in the back garden; but all patients do better in the open air, anywhere, as was shown years ago in the grimy open air of Sheffield. Dr. Lister, like most of us who have followed their cases over a long period, has generally regretted allowing home treatment. Dr. Muthu has found it was more or less a failure, and all the evidence confirms Dr. Crace-Calvert's advice that sanatorium treatment should precede home treatment. The educational factor is very important. One speaker said the lessons learned in a sanatorium are largely forgotten; but Dr. Meek says that he finds the working classes are "intelligent and easy to instruct, and make an attempt to carry out sanatorium principles in their subsequent life."

7.—INFECTION AND ENVIRONMENT.

We have heard a good deal about immunity and infection and the majority of speakers have endorsed the opinions of Dr. Lister that the occurrence of tuberculosis, as a disease, is due, in the main, to factors other than infection; that, indeed, the bacillus is a comparatively harmless pest to the great majority of us; and that, more than the mere presence of the tubercle bacillus, it has been proved that morbidity and mortality are chiefly due to social factors. Sir Douglas Powell said that, if there were no dirty surroundings and bad habits of life, the infection of tuberculosis would almost cease to be operative. Dr. Muthu sagely insisted that the disease was more a product of vicious environment than of infection; that it is man who creates the soil favourable to infection, and that without such suitable soil there could be no infection. This soil may be made receptive by mental as well as by physical conditions, so that "the mental factor is more important than the microbe." Dr. Latham is of opinion that "both the public and the profession paid too much attention to the infectivity of the disease." Most certainly, many do; and I found this view reaching an exaggerated importance during some recent visits to French military hospitals, where I saw the wretched *poitrinaires* frequently relegated to "Hôpitaux pour les Contagieux," and herded in the same institution with measles, scarlatina, and cerebro-spinal fever! It is certainly remarkable that the curve shown by Dr. Muthu (Fig. 1) demonstrates the steady diminution of tubercle for many years before the bacillus was discovered; then the level period; and now, in spite of the careful destruction of sputum, the increase of the disease in the well-fed and well-paid population of to-day. This fact reminds us that the stress and strain of life, which Dr. Latham gives as the chief pre-disposing factor, cannot be excluded even although we secure for every individual a suitable employment in a healthy environment.

The mental and moral strain of the refined and cultured is more keenly felt, and often cuts deeper, than the material strain of the labouring class. Those whose resistance to the tubercle bacillus is low, from whatever cause, hereditary or acquired, will fall a victim to it in clean and comfortable surroundings, even although they lead the higher life, sleep with their windows open, and no man spits in their path. Tuberculosis appears to be part of the price we have to pay for civilization and for much of the art which gilds the dull realities of life. In spite of material progress, there will still be candidates for consumption in families like the Brontës, writers like Louis Stevenson, poets like Keats, and musicians like Chopin. Dr. Lawson's patients—and he gives us the record of a thousand of them—did not come from homes of want with dirty surroundings. We all know the conditions



PHTHISIS RATES, ENGLAND AND WALES, PER 1,000,000 OF POPULATION.

Had the death rate in 1895–1915 made the corresponding decrease it did in the previous 20 years, 1875–1895, it would stand at 600 *per million.*

FIG. 1.—*Diagram illustrating the mortality of tuberculosis in England and Wales since the year 1877. The dotted line shows the steady decline up to the year 1901. In the following years the rate of decline was insignificant, and since 1912 there has been a steady rise in the mortality.* (Dr. Chowry Muthu.)

and occupations in which tuberculosis is the most common; but no class is exempt. Everyone must agree with Sir Arthur Newsholme that "infectivity and environment were factors which worked together."

CONCLUSION.

To summarize my summing-up, I would say that the debate has proved that the value of the sanatorium for suitable cases is established, and cannot be replaced by any other measures; and that it is useless to impeach sanatoria for their insufficient or unsatisfactory results when this debate has demonstrated that after-care is a necessary part of equal, if not greater, importance. The provision of this after-care is an urgent, complicated, and difficult problem, and must be considered and discussed elsewhere. "It is for the nation to devise larger and more comprehensive measures, such as farm colonies, industrial settlements, or garden cities" (Muthu), where the arrest secured by sanatorium treatment can be consolidated, and then, before he returns to it, the conditions of the patient's bad environment must be removed by improved dwellings, factories, and workshops. The public can be prepared for this by a more thorough education in the laws of hygiene, and by preaching the gospel of health in schools, homes, and pulpits.

Mr. Kingsley Wood, the chairman of the London Insurance Committee, wisely said that "this was not a single but a mixed problem"; and that the campaign against tuberculosis had many fronts. We doctors must leave a large part of the advance to our legislators and social workers. Our debate has helped to define for them the problem and indicate the lines of progress. We must not allow them to be misled. If they had thought that sanatoria alone were going to banish consumption from these islands, they were mistaken. If they still think that a few months in a sanatorium, without adequate after-care, will put a consumptive working man back in his factory, doing a full day's work regularly, they are being deceived. If they have the idea that any but, as a rule, quite early cases of tuberculosis can be lastingly cured, it is a vain hope. But they may be assured that sanatorium treatment is, at present, the first and best remedy we possess, and that its worth can only be secured by after-care. In any case we would beg them to push on with sanitary legislation, so that the laws of health are carried out as well as enacted; with a Ministry of Health, so that a subject like this can be properly grappled; with Education Bills, so that the coming generation may not perish from want of knowledge; with town-planning and house construction, so that we have solid, dry, well-warmed and well-ventilated dwellings and workrooms; and with domestic training, to give us properly cooked and selected foods. Many of us would ask for a regulation so that good, light beer might supplant villainous whisky; for opportunity and education to supply, and make welcome, more wholesome distractions and pastimes; and for fair work and wages to be obtainable by all. When all this has been accomplished the ideal of Dr. T. D. Lister will be more than realized, for not only will everyone live and work under sanatorium conditions, but there will be little or no need for sanatorium doctors! Or, at most, they will only be required for those who will have none of these good things,—chiefly, I imagine, the professional classes; or for those, who, having them, still fall upon the thorns of life and are unfortunate enough to be the Brontës, the Keats, the Chopins, or the Louis Stevensons of this unintelligible world!

ENURESIS AND OTHER COMMON DISORDERS OF CONDUCT IN CHILDHOOD.

BY HECTOR CHARLES CAMERON, M.D., F.R.C.P.

Physician in Charge of Children's Diseases Department, Guy's Hospital, etc.

SUSCEPTIBILITY OF CHILDREN TO SUGGESTION.

AMONG the children of the well-to-do, it is seldom that their physical needs are seriously neglected. Mothers and nurses know all about the need for fresh air, regular meals, and a sufficiency of sleep and exercise. Nevertheless, the hygiene of the mind is often completely overlooked. The child, who is the sole pre-occupation of his parents and of his nurse, is apt to grow up in an atmosphere of fuss and worry and of excessive solicitude, which undermines his vitality both morally and physically. The manufacture of neuropathy is proceeding unchecked in a great many nurseries at the present day. No doubt hereditary factors play a part, but it is certain that it is just among those children who inherit a sensitive and unstable nervous system that faults of management most readily produce disturbance, and correction of these faults the most gratifying improvement.

Perhaps the most striking quality of the child, and especially of the nervous child, is his extreme susceptibility to suggestion. He has no knowledge of his own individuality apart from ideas derived from those around him. Turn where you will, you will find the child shaping his conduct and behaving in accordance with suggestions which he has received from nurse and mother. No one who is unable to utilize all this suggestive force for good and not for evil can produce good results in the nursery. Where children are left pretty much to themselves—in large families and among the poor, for examples—no one of the disorders we have to consider arises. Placid, comfortable people who do not worry about their children, find them, for the most part, fearless, reasonable, and normal in their behaviour. An atmosphere of apprehension and unrest in the household rapidly communicates itself to the child. That which is feared for him and thought of him—that he rapidly becomes. If he is given the reputation of eating well and sleeping well, of having a regular action of the bowels, of making no fuss when he falls, of not being afraid of the dark or of animals, and so forth, it will not occur to him to question that these things are characteristic of him. If every day we make the opposite suggestion to him, whether by the subtle communication of our own worries and apprehensions or openly by what we say of him in his hearing, then with equal facility he acts in accordance with these ideas derived from us. He has no acquired experience to guide him and no faculty, therefore, of self appreciation or of self criticism. Almost entirely his conduct is governed by the direct or indirect suggestions of those around him.

REFUSAL OF FOOD.

Take, as a first example, the matter of his likes and dislikes for food. When a little child begins to enlarge his dietary and to encounter for the first time a variety of flavours, he may be seen to start and waver at each new sensation. With nervous children this hesitation may be prolonged and pronounced. The attitude of the nurse at this stage is all-important. Nothing should be done to concentrate attention on the difficulty. If he is appealed to and urged too much, if his suspicions are aroused by praising excessively the delicious flavour of the food, or if an attempt is made to force him to swallow, then a strong impression may be made upon his mind which may recur the next time he encounters the same article. If it then becomes a fixed belief in the mind of the nurse that there exists an antipathy to this particular food, her manner in offering it will be apt to be such as to add to the force of the suggestion. Still worse, words may be used in his hearing, referring to his persistent refusal. Before long he sees himself—and takes great pleasure in the thought—as a strange child whose peculiarity in refusing to drink milk, or to eat meat, green vegetables, or milk pudding creates a pleasant stir, and excites considerable interest in the minds of the grown-up people around him. The longer the suggestion acts, and the greater the attention paid to it, the stronger is the effect upon his mind, so that it is not uncommon to find these likes and dislikes persisting all through a long life—a legacy of unwise nursery management. Just so, there are people who declare themselves incapable of swallowing the smallest pill, though they can wolf their food with the best of us.

In more serious cases opposition extends to all food, so that medical advice has to be sought for want of appetite. And, indeed, the child seems absolutely without appetite, resolutely refusing to eat, clenching the teeth, shaking the head or shouting, " No, no." Such a misfortune only befalls a child whose behaviour in this respect visibly distresses his parents or nurse, and who fully appreciates the stir he has created. I once had a little patient two years old brought to me for this condition of anorexia nervosa. Three weeks before, he had been taken in the motor-car to mid-day Sunday dinner with his grandparents, where everyone had engaged in efforts to induce him to eat, but without success. I explained the origin of the difficulty to his parents, when his father said to me, " You have accounted for what the child said, when he saw the motor-car to-day for the first time since his visit to his grandfather three weeks ago. When it came to fetch him to you, he said at once, ' Not eat my dinner,' and we could not understand what he meant." In this child, the sight or sound of the preparation of food was sufficient to produce a paroxysm of opposition. At the same time, it was always said of him that he slept perfectly and gave not the slightest trouble in this respect, and to this suggestion he also reacted, because it never occurred to him to doubt that he was a little boy who made a fuss about his meals and had no appetite, but slept well.

The only way to cure the fault is to reverse the suggestion, to seize every reasonable opportunity to speak before the child of his improving appetite, to say that he now refuses nothing, or even at times to take his plate away, saying that he has eaten so much that he must eat no more. Above all, we must try to hide from the child that we care at all if he eats too little. A change of nurse is sometimes needed, because, unfortunately, although mothers are generally quick to appreciate the point, the nurse, with less education, is apt to persist in the policy of coaxing and urging. To her it seems as clear as daylight that to enforce one's wishes it is necessary to issue commands. The nurse who urges a child to eat, like the nurse who leaves the room with the parting injunction to the children not to put beads up their noses, has much to learn in the management of children.

Many of these children who show this resistance to food readily develop the further symptom of vomiting if, after much coaxing, struggling, and protesting, the food is ultimately swallowed. If this happens, a very large number of useful and nutritious articles of diet is apt to fall into disrepute as the cause of the disturbance, so that in the end the child's diet may come to be deficient in some necessary constituent. Pawlow's teaching on the dependence of gastric digestion upon psychical and emotional conditions has not, perhaps, been sufficiently appreciated in its bearings upon infantile digestion. In childhood, tears flow very readily, and the tears are not the only secretion under the influence of the emotions. Nervous unrest, fits of temper and crying—with their accompanying vaso-motor changes and the setting free of the internal secretions—undue excitement and excessive mental activity, all inhibit digestion, and in childhood as in adult age are common causes of dyspepsia. When a child returns from a children's party and suffers a reaction with much sickness, it is not always fair to blame the excessive or injudicious hospitality of his hostess.

ANOREXIA NERVOSA IN ADULTS.

This symptom of refusal of food may be met with occasionally among adult neuropaths. A case which excited some interest at the time, and was duly recorded in the *Guy's Hospital Gazette* for June 2, 1917, may be recalled. It was that of a young man, who had always been nervous, and had survived, apparently with some difficulty, an ailing and invalid childhood. His appetite had always been poor. Recently, since he had received papers calling him to the army, all desire for food had disappeared, and he persistently refused the appeals of his mother and friends that he should at least try to take food. His mother thought that sometimes he took some food by himself "on the sly." When he was brought to me in the Out-Patient Room, we thought that we had never seen anyone so emaciated, yet there was no sign of any organic disease. His weight was only $4\frac{1}{2}$ stone.

He was admitted to the hospital for treatment, but before anything could be done he endeavoured to commit suicide by setting fire to his bed. His death followed soon afterwards.

Again, at another time, I had under my care a girl of 20 years of age, who had suffered for many years from uncontrollable vomiting and an appetite so capricious that at times she would eat nothing but apples. She had been a premature baby, and had been nursed through years of delicate infancy and childhood with most loving and most injudicious care. The vomiting and emaciation had become so distressing, that she had been under medical treatment for many years. It had even been proposed to perform gastro-enterostomy. In a home where the sister-in-charge devoted herself to the work of disciplining and bracing the moral character weakened by years of indulgence, she made rapid progress. Her weight increased by three stone, she took food well, and there was no vomiting. Finally, work was found for her, and she left the home bearing with her a sum of money taken from the sister's purse.

Such cases, with which we all meet from time to time, shed light upon the common anorexia nervosa of childhood. Often, indeed, as in the two examples I give, they show the survival of an infantile disorder of conduct into adult life, which becomes more noteworthy only because it occurs in a patient who should have reached years of discretion. In all cases, the refusal of food is a kind of "negativism." The greater the efforts to persuade, the stronger the resistance. In the adult patients, it was known that at times at least they fed comparatively heartily, "on the sly," so long as there was no appeal to them. In children, as in adults, we shall not find the symptom of refusal of food the only nervous symptom present. In the two cases quoted, we note the attempt at suicide and the theft. In children, we shall not often find such distressing complications as these, although they do occur, but we shall nearly always detect other clear signs of nervousness due to faults of management, such as enuresis, stammering, phobias, or tics.

REFUSAL OF SLEEP.

As common and almost as distressing as refusal of food is refusal of sleep. Here, again, the difficulty is caused by unwise suggestions made to the child. His attention has been directed to the difficulty. It is foolish to bid a wakeful child to go to sleep, to exhort and to urge him. No one can send himself to sleep by force of will alone. When we go to bed we are seldom so tired that we fall asleep from sheer exhaustion. Yet so soon as the healthy man, whose mind is at rest, finds himself between the sheets, he falls asleep almost with the force of an hypnotic suggestion. It is suggestion which acts, not will power. The attempt to substitute a voluntary effort for the forces of suggestion, which have acted on unnumbered nights and have produced the habit, is, indeed, a chief cause of the insomnia. Again and again the sleepless man tosses from side to side and fruitlessly resolves that now he *will* go to sleep. It is the same with children; by urging them and appealing to them to go to sleep, the mother has emphasized the difficulty.

CONSTIPATION.

Much of the common constipation of the nursery is due to the same cause. The excessive concentration of the nurse's thoughts on this daily question communicates itself to the child. The difficulty is emphasized, and again an attempt is made to substitute will power for forces of suggestion, which are at once inhibited by concentration of the mind upon the process. Here also, just as in the refusal of food, a further stage of "negativism," that is, of active resistance with crying and struggling, is reached, so that complaint may be made by the mother that defæcation is painful. The same negativism may be shown in micturition, and painful micturition is also a frequent complaint.

JEALOUSY AND WANT OF AFFECTION.

Mothers will sometimes complain of the jealousy of an older child to a newly-born brother or sister. Students of the writings of Freud have seized upon this to demonstrate that the older child resents the mother's love for the newcomer, and fears a rival in her affections. Close observation of the child will not often, I think, support this view. If the mother adopts the right attitude to the older child and takes him freely and fearlessly to the new baby, sharing her delight in it with him, the child will copy her closely, using the same endearing words to the baby, so that in no time his reputation is established that he is fond of the baby and good to it. If, on the other hand, the mother, from fear of what may happen, is not able to free her manner and tone of voice from some apprehension, if the child is constantly warned not to hurt the baby, if he is forbidden to go to the cot and the baby is always snatched from his reach, then he will persist in his attempts to get at it, will regard himself as a danger to it, and may even act so as to confirm the mother's belief that he will do it harm.

In the same way, some children will seemingly be actuated by an intense and unreasonable dislike for their father whom they see only at intervals and on state occasions. They will cry and resist whenever they are in his presence. Again, this is not because the child scents a rival for the affection of his mother, as Freud would have us believe, but only because the child's father—like his bed and his dinner—has been proffered to him with the wrong suggestion. He is acutely conscious of all the disturbance and distress his conduct creates, and he will persist in it so long as it is taken thus seriously.

ENURESIS.

By a somewhat roundabout way I have approached the main subject of my article. I have dealt first with some of the other common disorders of conduct in childhood, selecting those which show most clearly their origin in the apprehensions of the grown-up people who have charge of the children, and in the unwise suggestions which they convey to them. The same forces are at work in the production of enuresis, or bed-wetting, although the matter is here often complicated by the development later on of a sense of shame and unhappiness in the child. There comes a time when the child passionately desires to regain control and is miserable about his failure, until the concentration of his thoughts on the subject becomes a veritable obsession. Every night he goes to bed with this only in his mind. Every night he falls asleep miserably aware that he will wake to find the bed wetted. The suggestion, impressed in the first place on the mind of the tiny child by injudicious management, has become fixed by the growing sense of shame and the complete loss of self-confidence.

CAUSES OF ENURESIS.

It is usually taught that a great variety of causes is concerned in producing enuresis. It is said to be due to a partial asphyxia during sleep from adenoid vegetation. It is said to be caused by phimosis, and to be cured by circumcision. It is said that the urine is often too acid and so irritating, that the bladder refuses to retain it for the usual length of time. It is said that enuresis may be due to a deficiency of the thyroid secretion, and that it can be cured by thyroid extract. Such a number of rival causes may make us hesitate to accept the claims of any one of them. Certainly I have not been able to satisfy myself that any one of these conditions exercises any influence at all, or is commonly present in cases of enuresis. I think that if we examine a large number of cases of bed-wetting in children, we can come to no other conclusion than that the cause of the trouble is due to just such a perversion of suggestion as we have been considering above.

ENURESIS AND NEUROSIS.

There are certain points in the behaviour of a child with enuresis which seem to point to this conclusion.

(*a*) In the first place, the trouble is seldom serious or very well developed in early childhood, and the reason for this, I take it, is that an occasional lapse in a child of perhaps two or three years of age is usually treated lightly and in the proper spirit of tolerance. It is only with children a little older that nurses and parents become distressed and begin unwittingly by urging the child to present the suggestion to her mind that the bed may or will be wetted. Hence the usual history is that control was partially acquired in the second year, but that, instead of later becoming complete, relapses began to be more frequent, and that since that time all that can be done seems only to make matters worse.

(*b*) In the second place, the influence of suggestion is shown by the behaviour of the child when removed to a hospital for observation. It is the invariable experience that the enuresis then promptly stops. In hospital, the attitude of those around the child is entirely different. He has the comfortable and consoling feeling that in wetting the bed he is doing exactly what is expected of him. There is even a feeling that if he does not, he is showing himself to be something of a fraud, and that he has then been admitted to the hospital on false pretences. Hence, perhaps for the first time in many years, the child is free from the obsession, and the bed is not wetted.

(*c*) In the third place, it is easy to recognize in the history of many of the cases the ill-effects of circumstances which add new force to the fear of failure or shake the confidence in the control which had been regained. Thus a boy, an only child, who had suffered from enuresis till his seventh year, had regained complete control till his eleventh year, when he went to school. In his dormitory at school was a boy who had enuresis, and was being fined and punished by the schoolmaster. The enuresis at once reappeared, and continued unchecked so long as he was at school. As might be expected, school life is very inimical to cure, unless the trouble can be kept from the knowledge of the other boys. Anything which directly increases the nervousness of the child—an illness, for example, with loss of weight and failure of nutrition, or some mental stress, such as the approach of an examination—is apt to accentuate the enuresis.

(*d*) In the fourth place, the incontinence sometimes spreads to the daytime, and the child is wet both by day and night. Further, in bad cases, it is not uncommon to find incontinence of fæces making its appearance as well. These extensions of the fault only take place when the management continues to be very faulty, when the grown-up people around them are more than usually distressed and pessimistic, and have redoubled their expostulations and appeals.

Now these peculiarities of enuresis seem to me only explicable, if we assume that the want of control is due to auto-suggestion, dependent at the beginning on the unwise attitude adopted towards the fault by the nurses and parents, and later kept up by the sense of shame and the mental distress involved. The origin of this disorder of conduct is comparable to that of the other disorders of conduct which we examined at the beginning, such as refusal of food, refusal of sleep, or the apparently incontrollable desire to bludgeon a baby brother.

TREATMENT OF ENURESIS.

The forms of treatment which have been recommended from time to time are, as might be expected, very numerous.

(*a*) *Operative.*—(i) Removal of tonsils and adenoids. (ii) Circumcision.

(*b*) *Manipulative.*—(i) Injection of saline solution under the skin in the perineal and pubic regions, with object of lowering the excitability of the bladder by counter irritation. (ii) Gradual distension of the bladder by hydrostatic pressure. (iii) Tilting the foot of the bed so as to throw the urine to the fundus of the bladder to protect the sensitive trigone from irritation.

(*c*) *Educative.*—(i) Curtailing the fluid drank. (ii) Waking the child at intervals during the night by an alarm clock or otherwise. (iii) Rewards and punishments.

(*d*) *Medicinal.*—(i) Belladonna. (ii) Thyroid extract.

(*e*) *By Suggestion.*—(i) By simple suggestion. (ii) By hypnotic suggestion.

I do not think that any single one of these various forms of treatment under the first four heads has any effect other than as an aid to the suggestion of cure, which we proffer in adopting it. Removal of tonsils and adenoid vegetations might conceivably cure an enuresis which is nocturnal, it cannot account for an incontinence which spreads to the day. We might believe that to distend the bladder by hydrostatic pressure was a cure for incontinence of urine, and that it acted by removing the local cause, the smallness and contraction of the bladder, were it not that the loss of control is so apt to spread to the rectum as well. There is no evidence that the urine is peculiarly irritating. Indeed, such evidence as we have goes to show that, as in some other neuroses, the urine in enuresis is unduly copious, and of very low specific gravity. Incidentally, we have in this polyuria a further argument against the view recently advanced that a small and contracted irritable bladder is the cause of enuresis. We do, of course, meet with cases of irritable bladder often enough, but the complaint is then never of incontinence, but always of the discomfort of having to rise so frequently for micturition.

To deprive the child of fluid, to wake him many times at night, to tilt the foot of the bed, are devices which may help in the hands of someone who is confident of his ability to cure the condition, and can communicate this confidence to the child. Carried out hopelessly and pessimistically by a tired and exasperated mother, they are well calculated to strengthen the hold which the obsession has on the child, so that often enough we meet with a mother, who, rightly enough, maintains that the more she wakes the child, the more often the bed is wet.

The treatment of enuresis to be successful must be conducted through and by means of the grown-up persons who have the control of the children. To stop the development of enuresis in early infancy we must intervene to prevent the concentration of the child's mind on the difficulty. During the time when control is ordinarily developed, in the second and third year, judicious management of the child is essential. The emphasis should be laid upon successes, not upon failures. For every child, his reputation will sway in the balance for a time. He must be helped and encouraged to self-confidence, not rendered diffident or self-conscious.

If the case is well established before it comes under our notice, the mother, the nurse, the schoolmaster, or whoever is responsible for the child's management, must understand with us exactly what has happened. The suggestion acting on the child's mind must be altered, and self-confidence restored. The child must learn to see that the thing is not so desperately tragic. He should be told that it always gets well, and that it only goes on now because he is worried about it and keeps thinking of it. If the whole environment of the child is bad, so that such a change of suggestion is not possible, and if enuresis is but one of many symptoms of mental or moral instability, it may be necessary to remove the child and place him under the influence of some one else. Sometimes the prescription of a rubber urinal, which the child can slip on at night, is directly curative. A public school boy, who was about to be sent away from school for this failing, fortified by the possession of this apparatus, wrote six months later to say that he knew now that it must be all worry that caused the trouble, because with the urinal in position he had not once had the incontinence.

In inveterate cases, hypnotic suggestion is always, I think, successful. It is obvious, however, that in many cases there are objections to its use. More often than not, the occurrence of enuresis is evidence that the child's home environment has been at fault, and that his mental and moral development has been retarded. The home is the culture medium, and the crop grown in this case has not been satisfactory. It is the home and the management, which must be promptly modified or, if necessary, changed. Hypnotic suggestion will make this one symptom disappear promptly enough, but it will rather perpetuate than combat the cause, that undue susceptibility to suggestion, which is characteristic alike of the little child and of many older neuropathic persons.

GENERAL PRACTICE AND THE NERVOUS DISORDERS OF CHILDREN.

In general practice we are often called upon to deal with these functional disturbances in nervous children. As a rule, the children are brought because mothers and nurses have made up their minds that there is something wrong physically, that the child is constipated, that the micturition is painful, that the liver is out of order, and so forth. It usually happens that physical examination shows no signs of disease, and when the mother is told so, she is apt to be disappointed that no explanation is found for the symptoms, and to conclude that her doctor is wanting either in skill or in interest for the ailments of little children. On the other hand, a frank explanation of the origin of the symptoms in faults of management will not often fail to convince the mother, because the extreme nervousness of the child is generally obvious to all who come in contact with him. To attempt directly to control disorders of conduct such as we have considered by medicines, is to attempt an impossible task. And really, when we come to look closely into it, the study of these neuroses of childhood and infancy are not without an interest of their own, and become of great importance when we have to consider the causes of neuroses in adult life. Actually, they form so great a part of general practice, that I think they deserve closer attention than is commonly given to them.

RECENT ADVANCES IN DERMATOLOGY IN CONNECTION WITH THE WAR.

By J. M. H. MACLEOD, M.D., F.R.C.P.

Physician for Diseases of the Skin, Charing Cross Hospital.

In this contribution I propose to refer to the following subjects which are of special interest in that they are connected with the war, namely, (1) Dermatitis, due to the handling of high explosives; (2) the more common skin affections which have been met with in the army in France; (3) the "open method" of treating burns under a natural scab.

(I) DERMATITIS FROM HIGH EXPLOSIVES.

All of us who have been working in the dermatological clinics in London, and in certain districts in the provinces, have been familiar since the beginning of the war with various degrees of dermatitis, which have resulted from the handling of high explosives with irritating properties, such as tetryl, trinitrotoluene, lyddite, etc.

The dermatitis produced by these different explosives is practically indistinguishable, though the staining of the skin associated with it may be characteristic; on the other hand, the explosives differ to a considerable extent in their capacity for being absorbed and for giving rise to toxic symptoms.

TETRYL.

During the past two years a number of important papers have appeared on the effects of tetryl, such as those by Drs. Enid Smith (*Brit. Med. Journ.*, April 29, 1916, p. 618), Lucy Cripps (*Brit. Journ. Derm. and Syph.*, January 1917, p. 3), and William L. Ruxton (*Ibid.*, p. 18).

The irritating properties of this substance are so great that it is liable to produce dermatitis in a considerable proportion of those working with it. Chemically, tetryl is trinitro-phenyl-methyl-nitramine, and it occurs in the forms of a powder, fine crystals, coarse dark crystals, and granular masses. It is in its powdery form that it is most potent as a mechanical irritant, for it is composed of fine crystals with sharp edges, which have no great tendency to agglutinate. In the process of sieving the compound, the powder is given off in a cloud which becomes deposited on the floors, tables, clothes, and exposed parts of the skin, where it causes a dermatitis. It is responsible also for a yellow or apricot staining of the skin and hair, which may appear on the hands on the first day of working with it and on the face a few days later, and is more liable to occur in skins moist with perspiration than in those which are naturally dry.

The dermatitis usually comes out within a fortnight of beginning to work with the irritant. It varies from simple erythema to definite œdema or deep-seated vesication like dysidrotic eczema, and is associated with a type of itching so distressing as to interfere with sleep, and occasionally with septic complications from secondary infection.

As a rule, it attacks only the exposed parts, and is generally more pronounced on the face and side of the neck than on the hands, but it may also involve covered parts should the powder become insinuated beneath loose clothing. The eyelids are apt to be severely affected, and may be so swollen as almost to close the eyes, whilst there is usually more or less marked conjunctivitis. Occasionally the feet may be implicated from tetryl dust about the floor. Once an attack has occurred, the skin becomes so abnormally sensitive to the tetryl that, even if the worker is transferred to another department, a recurrence of the dermatitis may be determined by contact with clothes, or even with paper, soiled with it.

It has been met with not only in the workers themselves, but occasionally in those living with them from handling or washing soiled clothes which have been worn in the factory.

In addition to the dermatitis, symptoms of irritation may be caused in the mucous membranes of the upper respiratory passages and of the stomach from inhaling or swallowing the powder, such as sneezing, epistaxis, breathlessness, pain in the epigastrium, vomiting of bile, headache, and giddiness.

Symptoms of absorption are, as a rule, absent or transitory, and the serious toxic symptoms which occur in connection with trinitrotoluene are unknown.

Treatment.—The dermatitis heals rapidly when the worker is removed from exposure to the irritant under simple local treatment. Œdema may be reduced by calamine lotion or cold compresses; lead lotions should not be employed owing to its affinity to the tetryl. When vesication has occurred and discharges or crusts are present, the skin should be bathed with boric lotion or cleaned with olive oil and a dressing of calamine cream or zinc paste applied.

For the conjunctivitis, the eye should be irrigated with boric lotion and an astringent, such as collosol silver, used to reduce the inflammation.

Prevention.—The workrooms should be kept cool, well ventilated, and scrupulously clean. Closely fitting overalls of some glossy material should be worn, and before leaving the factory these should be removed, the skin thoroughly washed, and outdoor clothes put on.

As prophylactic measures, hardening the hands with methylated spirit and the application to the face of a bland powder, containing zinc oxide and starch, have been recommended.

On no account should persons be employed who are suffering from inflammatory affections of the skin, such as eczema, psoriasis, or impetigo.

TRINITROTOLUENE.

Of the various communications which have appeared recently in connection with the handling of this highly irritating substance, the most authoritative are embodied in a discussion which took place at the Royal Society of Medicine, London, in January, 1917, on " the origin, symptoms, pathology, treatment, and prophylaxis of toxic jaundice observed in munition workers," under the chairmanship of Surgeon-General H. D. Rolleston, R.N., C.B.

Trinitrotoluene is given off in the form of a fine dust in sieving or filling canisters and shells, which is apt to cover the operators and to insinuate itself over the tops of stockings or socks and down the neck. On reaching the skin it gives rise to a severe form of dermatitis, and by being absorbed may lead to serious, and sometimes fatal, toxic symptoms. Like tetryl it may be inhaled or swallowed, and so give rise to irritation of the gastric mucosa or to that of the upper air passages. The dermatitis and internal toxic symptoms seldom occur together, and when a dermatitis is set up, it either prevents the absorption of the powder or neutralizes it by the inflammatory reaction of the skin.

Dermatitis.—In mild cases, the dermatitis consists of a superficial erythema of a patchy type, while in severe cases there is more or less pronounced œdema and a papulo-vesicular or bullous eruption of the type of cheiro-pompholyx, which, on healing, is followed by coarse exfoliation. The vesicles and bullæ are apt to become secondarily infected, and suppuration or even superficial ulceration may supervene. Associated with the dermatitis, there is more or less intense itching.

In addition to the inflammation, there is a yellowish staining of the skin, which is especially noticeable in the creases of the palms, but is not so intense as that caused by tetryl. It is the exposed parts which are most affected, the dermatitis being specially severe where the skin has been chafed by tight bands about the wrists and neck. It may occur also on the feet and ankles, and occasionally may reach the upper parts of the thighs and groins.

General Effects.—The general effects, which may be of a most serious character, consist of toxic gastritis, toxic jaundice, and toxic anæmia. Of these the most common is the toxic gastritis, which is evidenced by a general depression, sickness, vomiting, pain in the epigastrium, distension of the abdomen, and a high-coloured urine containing trinitroluene.

The toxic jaundice is of the simple catarrhal type, with slow pulse, bile in the urine, and constipation, and it may have a fatal issue from hepatic insufficiency, the end being preceded by convulsions and sometimes by cutaneous hæmorrhages.

The toxic anæmia, which is of a grave and fatal character, is fortunately a rare complication. In it there is a definite leucopenia, a lower percentage of polymorpho-nuclears, and a relative lymphocytosis.

Ætiology.—Idiosyncrasy has an important bearing on the ætiology of this form of dermatitis, some skins being singularly immune to the ill-effects of the explosive, while others are so susceptible that it may make its appearance within a week of coming in contact with it, and may recur with every subsequent exposure however slight. It is most common in the hot weather, when the skin is moist with perspiration, and is specially liable to occur if the skin is greasy, for the trinitrotoluene is soluble in oil.

Treatment.—When the dermatitis appears, it is essential that the patient should avoid further exposure to the irritant until complete recovery has taken place. As a prelude to treatment, all traces of the trinitrotoluene, which may be adherent to the skin or hair, should be removed by gently rubbing the skin with ether or oil. Calamine lotion or a bland zinc paste should then be applied, or if the irritation is severe a compress of weak tar lotion. Should the skin be septic, a two per cent. ammoniated mercury ointment should be substituted, or a boric acid compress.

The general treatment of the toxic gastritis and toxic jaundice is thus summarized by Rolleston :—" The treatment consists in removal from work, rest in bed for a day or two, milk diet with alkalies to combat acidosis, demulcent drinks, such as barley water, and the correction of constipation." No effective treatment has yet been found for the toxic anæmia.

Prevention.—For the prevention of the dermatitis and the symptoms of absorption, similar measures should be adopted to those described in connection with tetryl.

LYDDITE.

Lyddite has an irritating action on the skin, due to the picric acid it contains, and gives rise to an acute dermatitis similar to that caused by trinitrotoluene. As a rule, it is especially evident on the hands and forearms, and is accompanied by a canary-yellow or greenish staining of the skin.

DERMATITIS DUE TO EXPLOSIVES USED IN AIR-RAIDS.

In June, 1917, a number of cases of dermatitis occurred as the result of handling a powder from high explosive bombs dropped in the raids.

A typical case came under my observation in the Skin Department at Charing Cross Hospital in a naval gunner, who was detailed by the Admiralty to remove the detonator from an unexploded bomb which had crashed through a house in the East End of London, and in so doing had come in contact with the powder. When I saw him, which was about ten days after performing this duty, his hands were stained an orange colour, were swollen and œdematous, his skin felt hot and tense, and there were deep-seated vesicles and small bullæ between the fingers and on the dorsa of the hands like those of dysidrotic eczema.

Dr. J. H. Sequeira (*Brit. Med. Journ.*, August 4, 1917) reported a series of cases of a similar nature, which he had met with at the London Hospital, and stated that the powder had been identified as a mixture of trinitrotoluene with an excess of the explosive known as hexa-nitro-diphenyl-aminic, which is closely related to aurantia, an orange-coloured base aniline dye used in dyeing cheap leather shoes, and pointed out that the dermatitits had all the characteristics of aurantia dermatitis which had been described by the late Dr. Radcliffe Crocker.

In all the cases, staining of the skin took place at the time of contact with the explosive, while the dermatitis did not appear till after a latent period of about ten days. On the ninth day irritation of the skin developed, which was sometimes so severe that it prevented sleep, and an eruption of deep-seated vesicles, like those of dysidrotic eczema, appeared on the palms and sides of the hands and fingers, inter-digital clefts, and sometimes in the corresponding situations on the feet. The vesicles tended to coalesce to form bullæ, varying in size from a large pea to a hen's egg, which occasionally became septic through contamination of the contents with pyogenetic cocci. In about a week they generally dried up, and the dead epidermis desquamated in flakes leaving a shiny pink surface covered with newly formed epidermis. The face was sometimes involved, when the eruption presented an eczematous appearance. The dermatitis rapidly healed under local treatment, which consisted of bathing the skin with a weak alkaline solution and the application of calamine cream or zinc paste.

(2) SKIN AFFECTIONS MET WITH IN THE ARMY IN FRANCE.

In April, 1917, Major Henry MacCormac, R.A.M.C. (T.C.), read an important paper at the Royal Society of Medicine on the subject of " Skin Diseases and their Treatment under War Conditions." In it he pointed out that a number of unusual skin affections had arisen among the soldiers in the field, and that the usual types had been greatly modified owing to war conditions.

Out of one thousand cases, which he analysed and which had been diagnosed as scabies, boils, and/or impetigo —the commonest affections met with—65·9 per cent. were directly attributable to scabies. Consequently, the treatment of scabies—which amounted to a veritable scourge—was of the first importance. For it to be successful, the author laid down three conditions, namely, (*a*) that the burrows should be opened to permit access of the parasiticide to the insect and ova; (*b*) that the parasiticide should be of such a nature as to destroy the parasite without causing dermatitis; (*c*) that the contact clothing and blankets must be disinfected to prevent a re-infection. These objects he obtained by a hot bath, soap, and a soft brush, followed by the application of sulphur ointment twice daily for three consecutive days, and the disinfection of the clothes by steam or a sulphur vapour apparatus. He found that sulphur treatment was more satisfactory and much less expensive than that by such substitutes as Balsam of Peru and Beta-naphthol.

He drew attention to a peculiar variety of impetigo, which commonly occurred in association with scabies, and was distributed chiefly on the buttocks, elbows, and knees. It was of the ecthymatous type, and was caused by streptococcal infection.

Seborrhœa was another disease which had frequently occurred, and had proved more resistant to treatment than any other class of cutaneous affection met with in the army. When well marked it affected chiefly the scalp, eyebrows, beard, and moustache, and presented a picture which was easily recognized. It tended to pass through three phases, namely, a dry erythemato-squamous condition; a stage of eczematization characterized by weeping, usually limited to the scalp; and third, a stage of impetiginization with stuck-on crusts, due to contamination with streptococci.

The treatment for this condition, which he found to be most valuable in the early stages, was calamine liniment applied in the following manner:—The scalp was first shaved, and lint soaked in this substance was applied over the head and face, pledgets of cotton wool soaked in the liniment were packed into the ear and behind the ear to keep skin surfaces apart, and the whole area was then covered with dry wool and bandaged. Later, more stimulating remedies were cautiously tried.

The treatment of the disease away from the face presented no difficulty, and weak sulphur ointment and strong perchloride lotion proved satisfactory.

Of the other diseases met with, the most common were Pityriasis rosea, which, during the summer of 1916, assumed almost epidemic proportions, a curious form of papular uticaria, and psoriasis.

Another paper bearing on this subject has been contributed by Captains H. C. Semon and H. W. Barber, R.A.M.C. (T.C.), (*Brit. Journ. Derm. and Syph.*, 1917, XXIX., p. 173), entitled "Pyodermia of Parasitic Origin." The object of this paper was to establish the parasitic ætiology of pyodermia of the trunk and limbs among the soldiers, to emphasize the striking differences in the clinical pictures produced by the acarus and the louse, and the therapeutic measures which had given the best results in the hands of the writers.

The chief points in the differential diagnosis of the eruptions due to pediculosis and scabies were connected with the localization of the eruption and the type of lesion.

In scabies, the eruption was present on the hands, wrists, elbows, umbilicus, and abdomen, lower triangular area on the buttocks, penis and scrotum, front of the knees, ankles, and feet; whilst in pediculosis, it was present chiefly on the posterior axillary fold, shoulders, sacral region, and upper parts of the buttocks, groins, thighs, and the skin between the knees and the ankles.

The types of lesion in scabies consisted of burrows, vesicles, small superficial crusts, papules, pustules, and a specific erection of the pilo-sebaceous follicles, with secondary eczematization in the seborrhœic cases, while scratch marks were represented by minute blood crusts at the apices of the erected follicles; in pediculosis, they consisted of superficial and deep pustules with a surrounding red and indurated halo, circular encrusted ulcers of varying depth and size, but larger than those met with in scabies, and linear impetigo.

Infection with both the parasites was quite common, when the two clinical pictures were super-imposed.

An important point emphasized by the writers was that the pediculus vestimentorum not infrequently laid its eggs in the hairs of the pubes and perineum and sometimes of the axilla, and that measures directed towards the sterilization of the clothes could not be efficient unless the host himself was disinfected at the same time.

The treatment which the writers recommended for the secondary pustular lesions resulting from pediculosis, consisted of the application of an ointment, containing acid. salicylic gr. 10, sulphur. præcip. gr. 10, Ung. hydrarg. oxid. flav. to 1 oz. which was kept applied day and night on lint, and led to healing of the superficial ulcers in the course of a week.

(3) THE "OPEN METHOD" OF TREATING BURNS.

The treatment of burns has attracted considerable attention since the outbreak of war, owing to the frequency with which they have occurred in the field from liquid fire, petrol, etc., and in connection with aeroplane crashes.

A number of contributions have appeared in the medical press with regard to the paraffin treatment of burns, which was introduced in France by Dr. Barthe de Sandfort, who employed a proprietary preparation of paraffin, wax, and resin, known as "ambrine." It is not to this treatment, however, to which I wish to refer here, but to that known as the "open method" in which healing is allowed to take place under a natural scab. In some ways, the latter method is preferable to the paraffin treatment; the process is extremely simple, and the results obtained from it, in my experience in the treatment of extensive burns in the hospitals of the Royal Flying Corps, etc., have been so encouraging that I consider it ought to be better known and more generally adopted.

It is particularly applicable to burns of the leg and face, though it can be used for those of any part of the body, and is especially serviceable in the healing of the granulating surfaces which occur after the separation of the eschar.

In it no dressings are employed, but the raw surface is exposed to the air and simply powdered over with a bland aseptic powder, which cakes up with the discharge to form a crust under which healing takes place.

In the case of a burn of the leg the procedure is as follows: A mackintosh sheet is placed on the bed and over this a long pad of cotton wool covered with gauze on which the leg rests; over the leg is placed a cradle to keep off the bedclothes. If the flexor aspect of the leg is affected, it may be necessary to sling the limb from the cradle by gauze bands to prevent it from coming in contact with the bed. When the limb is in position, the granulating surface is freely dredged over with a non-irritating detergent powder, such as sterilized stearate of zinc or magnesium carbonate. To render the powder adherent, 10 per cent. of paraffin may be added, as in the following mixed powder, which was made for me by Messrs. John Bell and Croyden and fulfils all the requisites: stearate of zinc 20 per cent., magnesium carbonate 40 per cent., lycopodium 5 per cent., diamatos 25 per cent., paraffin 10 per cent., ol. citronnel q.s.

This powder is added from time to time by means of a dredger or insufflator, until the scab becomes a coarse, uneven, yellowish-green crust, a quarter-of-an-inch to half-an-inch or more in thickness.

Once formed, the scab should be left alone and allowed to dry up, crumble, and separate naturally. Should the discharge beneath it be excessive, it may be necessary to remove a small portion, bathe away the sero-purulent fluid and re-apply the powder.

A minor disadvantage of the treatment is that the odour of the sero-pus may be offensive, but this, if slight, is neutralized by the addition of an essential oil to the powder, or by placing a small vessel containing Condy's Fluid within the cradle.

This method is ideal, in that it allows Nature to heal the part and avoids the injurious action of antiseptics; it leaves the wound at rest, and does not necessitate periodical redressings, with their associated pain and interference with the new growth of epidermis each time the dressing is removed; the pressure of the scab restrains the formation of exuberant granulations, and leads to the formation of a pliant scar which has comparatively little tendency to contract.

Although this treatment may be employed in burns of the second degree, and in the early stages of those of the third degree before the eschar has separated, it is of greatest value when all dead tissue has sloughed away and a raw granulating surface is left.

THE IMPORTANCE OF DIASTOLIC READINGS IN THE DIFFERENTIATION AND TREATMENT OF HIGH BLOOD-PRESSURE CASES.

By O. K. WILLIAMSON, M.D., F.R.C.P.

Assistant Physician to the Westminster Hospital and to the East London Hospital for Children; Physician to the City of London Hospital for Diseases of the Chest, Victoria Park.

In this article, it will be my endeavour to give reasons why, in making blood-pressure observations for the purpose of diagnosis and treatment in cases of high arterial blood-pressure, it is not sufficient and is, in fact, misleading to take, as is too often done, merely systolic or maximum readings, but that the vessel is only complete when the diastolic or minimum blood-pressure is also observed.

The essential points upon which I desire to lay stress are—

(1) That the determination of diastolic pressure, in addition to systolic, enables the physician to distinguish high blood-pressure cases, in which there is increased peripheral resistance from those in which the peripheral resistance is not raised, which may conveniently be called the atheromatous cases.

(2) That, having made the diagnosis, he will be in a position to adopt treatment directed towards reducing the increased peripheral resistance in suitable cases of this variety, whilst as regards the atheromatous type such measures will clearly be uncalled for.

A few words on the cardio-vascular conditions influencing systolic and diastolic pressure will be appropriate.

It will be remembered that the principal factors concerned in producing and maintaining a high pressure in the systemic arterial system are those connected with the state of the heart and that of the arterial tree. In the first place, in order to maintain the high pressure, the left ventricle of the heart contracts more forcibly than normally, or else with the normal force of contraction, acts at an increased rate, and thus drives into the aorta at each systole a larger quantity of blood. *Cæteris paribus*, this augmented cardiac, action alone will cause a rise of systolic pressure, but unless there should also be an increase of peripheral resistance, the diastolic reading will not show a corresponding rise, owing to the fact that there is an undiminished outflow into the capillaries and veins, but the pressure between the pulse beats will fall to a low level. Should there, however, be added to the results of augmented cardiac energy, from whatever cause, an increased obstruction to outflow as the result of vaso-constrictor influences which act upon the arterioles and smaller arteries or resulting from definite organic changes, which permanently diminish the lumen of these vessels, the rise of blood-pressure will be sustained between the systoles, that is to say, there will ensue a rise of diastolic pressure.

Again, should the natural elasticity of the arteries be impaired, in a greater or lesser degree as the result of disease, the whole arterial tree will tend to approximate to a system of rigid tubing, and the heart will carry on the circulation less effectively. Normally as the result of the elasticity of the arteries, the systolic pressure becomes gradually diminished on passing towards the periphery, and, as a consequence, energy which has been stored up, owing to the systolic expansion of the artery is given out again in the form of diastolic pressure. In the case, however, which we are considering, of a loss of natural elasticity, whilst the systolic reading in the periphery retains, or even rises above, its previous level, the diastolic will show a tendency to fall in proportion to the increase in rigidity, that is to say, the difference between the two pressure values, the pulse-pressure will rise.

Broadly speaking, then, we must consider two classes of high blood-pressure cases. Firstly are those in which the diastolic pressure is raised more or less in proportion to the systolic; in these there is increased peripheral resistance, which may or may not be persistent, and there is increased action of the left ventricle, which may or may not be hypertrophied. If the condition is temporary, it may be associated with some fault in metabolism, such as occurs in certain gastro-intestinal lesions, and is then readily responsive to remedial measures. Should it, on the other hand, be permanent, it is frequently accompanied with chronic nephritis, or it may go hand in hand with structural changes in the arterioles and smaller arteries, with or without renal defect.

In the second class, will be included cases in which the systolic pressure is raised out of proportion to the diastolic. In these there is a left ventricle which acts more vigorously than usual, and is often hypertrophied, which works, however, against a normal peripheral resistance, and any arterial changes which exist affect the large and medium sized vessels only. Under this heading come many cases of aortic incompetence. It is only in instances of the first class that it is, generally speaking, desirable to exhibit methods of treatment which aim at reducing the blood-pressure, for, in most cases, such measures will yield more or less benefit, according as they succeed to a greater or less degree in reducing the peripheral resistance.

Not only in cases of the second variety, the atheromatous, is the diastolic pressure little if at all above normal, but one would expect that, inasmuch as the peripheral resistance is not increased, the diastolic pressure, which is, after all, the expression of the peripheral resistance, would not show variations in proportion to the systolic, whether such variations result from treatment or, indeed, ensue as the outcome of various physiological influences or other factors. In the instances of increased peripheral resistance, on the other hand, the two pressures would, under such varying conditions, be expected to exhibit more or less parallelism. This assumption will, I am inclined to believe, be found to accord with experience; if so, one might, by comparing charts exhibiting both systolic and diastolic blood-pressures, obtain a useful aid in the differentiation of the two varieties of high blood-pressure cases.

It is obviously necessary to know what is the normal diastolic pressure. In the first place, it may be stated that, in the case of a young adult, a reading constantly above 90 mm. mercury is abnormal.

Dr. George Oliver gives the following limits of the " average normal arterial pressures determined by the auditory method with tactile systolic check."[1]

Age.	Systolic Pr.	Diastolic Pr.
20–40	112–125 mm.	65–80 mm.
40–60	125–135 ,,	80–85 ,,
60–80	135–165 ,,	85–90 ,,

It must be borne in mind that, in high pressure cases resulting from increased peripheral resistance, although both systolic and diastolic pressures are raised, the increments of rise above the normal are less as regards the diastolic pressure, than in the case of the systolic pressure, or to put the matter differently, that the higher the pressure the greater will be the pulse-pressure.

METHOD OF OBSERVATION.

The most generally applicable method of determining the diastolic pressure, a means which serves also to read the systolic, seems at present to be the auditory or auscultatory method proposed in 1905 by Korotkow, of Petrograd, and introduced into this country in 1910 by Dr. George Oliver. A convenient way of applying it is as follows :—

The armlet of one of the numerous modifications of the Riva Rocci instrument is applied around the upper arm, and a tambour, devised by Dr. Oliver, is adjusted so as to fit closely, but without appreciable pressure, over the brachial artery at the bend of the elbow and close to the distal side of the armlet. With this tambour is connected a binaural stethoscope in such manner that the tambour replaces the chest-piece. The armlet pressure is first raised to a point higher than necessary to obliterate the pulsation in the artery in the usual way, and the observer, using the stethoscope on gradually lowering the pressure, notices the following sequence of phenomena. A clear, sharp sound is heard, followed by a sound of muffled quality, which may be accompanied with a definite murmur, this again being followed by a loud, clear sound. This sound suddenly becomes dull, and thereafter vanishes. The point at which the clear sound first appears is usually a few millimetres above the point of reappearance of the pulse as noted by the ordinary tactile method, and is recognized as indicating the systolic pressure, whilst the reading obtained at the moment when the sound becomes suddenly dull before vanishing is usually considered to correspond with the diastolic pressure. In assigning due importance to the diastolic blood-pressure readings, note must be made of the frequency of heart-beat, for, other things being equal, the greater this is the higher will be the diastolic pressure, and, on the other hand, slowing of the cardiac rate will lower the diastolic level.

---

[1] *Studies in Blood-pressure.* 3rd edition. p. 109.

PRECAUTIONS AND FALLACIES.

J. A. MacWilliam and G. Spencer Melvin[1] point out that there are certain conditions in which the auditory method is inapplicable. The concurrent estimation of the auditory and tactile systolic indices is essential in the routine application of the auditory method. Thus the auditory reading should always be at least as high as the tactile; an auditory reading lower in value than the tactile one shows that the conditions are such as to make both systolic and diastolic auditory indications erroneous. An obstructed flow of blood through the brachial artery, due either to anatomical variation of the latter or to stasis of blood in the limb from excessively and quite unnecessarily prolonged compression, may constitute unsuitable conditions. Again, improper application of the tambour over the artery may cause the auditory indications to be erroneous. This cause of error is easily remediable. An armlet pressure much above that needed to obliterate the pulse, as tested by the tactile method, may fail to abolish the sound, which is conducted past the obliterated area of the artery, probably along the bone. The diastolic reading, however, is not interfered with by such a cause. Cases of unavoidable difficulty in the use of the method are apparently rare.[2]

In certain instances of tonically contracted arteries it has been found that, as a result of compressing the artery in the area of application of the armlet, the initial reading before the vessel is compressed may be decidedly higher than readings taken after compression, the difference being accounted for by increased resistance of the tonically contracted artery, a resistance which diminishes or disappears as the result of compression of varying duration. This compression may be applied by repeated inflations of the armlet, the air being allowed to escape completely after each inflation, or it may, indeed, be carried out by other means. The practical inference to be drawn from this fact is that, in high-pressure cases, it may be impossible to obtain a correct reading of the systolic pressure without applying compression in this way. The same fallacy does not apparently obtain in the reading of the diastolic pressure by the method which I have described.

---

[1] "Systolic and diastolic blood-pressure estimation, with special reference to the auditory method."—*Brit. Med. Journ.*, March 28, 1914.

[2] *Ibid.*

CASES.

In illustration of the conclusions arrived at a few cases may be cited.

An instance of a case of increased peripheral resistance, which was benefited by treatment is the following :—

A female, 51 years old, attended hospital on June 17, on account of pain in the chest, worse on exertion, and dyspnœa. She was a fat woman, with dilated venules on the cheeks. Heart normal; superficial arteries feel normal; systolic blood-pressure 180 mm., diastolic 150 (approximate) mm., pulse 80. A few sonorous rhonchi in lungs, râles at left base. Tongue furred, vomits soon after food. Urine sp. gr. 1021, no albumen. An alkaline bismuth mixture together with thyroid extract were prescribed. On June 24th the systolic reading was 158 mm., diastolic 110 mm. (approximate), pulse 97, and the effect of treatment was most satisfactory. The high blood-pressure in this case was partly at any rate the result of aüto-intoxication associated with dyspepsia.

The other two cases are instances of the atheromatous variety which, as regards the high blood-pressure, are not improved by treatment.

A female, 66 years old, attended hospital on March 9th, on account of pain in the back and dyspnœa. Heart not obviously enlarged, but first sound at apex prolonged and a systolic murmur at base of heart. Systolic blood-pressure 204 mm. Lungs normal. Urine sp. gr. 1016, no albumen. She was prescribed tabloids of nitro-glycerin gr. $\frac{1}{100}$ daily. On the 16th instant, the systolic reading was 185 mm. On this date she was ordered a mixture containing iodide of potassium gr. v., t.d.s., but on the 23rd inst., the systolic reading was 230 mm., and the diastolic (approximate) 100 mm. On the 30th inst., the systolic reading was 220 mm. On April 6, tabloids of erythrol tetranitrate, gr. $\frac{1}{2}$ daily, were ordered and a mixture containing potassium citrate, gr. xxx, t.d.s. On the 13th inst., the reading was 205 mm., the same as when it was first observed. This case seems to have been one of atheroma of the aorta, and there was no obviously good result from treatment thus used towards reducing the pressure.

A man, 68 years old, admitted to hospital on February 21,. Heart normal. Irregular thickening and tortuosity of the superficial arteries. Systolic blood-pressure varied between 160 mm. and 165 mm., the diastolic (approximate) between 80 and 90 mm., the pulse-rate being from 80–84. Signs of emphysema and bronchitis, and of dilated bronchi on the right side. Urine, no albumen. On September 12, 1916, he was admitted to a different hospital, the systolic blood-pressure being 164 mm. and the diastolic 85 mm. This patient was not treated with apressor remedies, but the very interesting fact that in about 8½ years his pressure both in regard to the systolic and diastolic values had remained unaltered, certainly tends to confirm the diagnosis that the arterial mischief was confined to the large and medium sized arteries, and that there was no general arterio-sclerosis, and from the fact that the lesion was not a progressive one, remedies directed towards relieving the peripheral resistance could have been of little advantage.

It would seem, therefore, that important aids to diagnosis and treatment may be obtained in high blood-pressure cases by noting the relations between the systolic and diastolic pressures, and in comparing charts with a view to observing the variations of the one in contrast to those of the other.

◆

A CASE OF PERSISTENT TACHYCARDIA: ITS CAUSE AND ITS CURE.

By C. EDGAR LEA, M.D., M.R.C.P.

Hon. Physician Ancoats Hospital, Manchester; Assistant Medical Officer, Manchester Royal Infirmary, late Captain, R.A.M.C.

J. E., aged 51, a well preserved man and of powerful physique, was first seen by me in the hospital O.P. on April 5, 1917. He complained of being short of breath on exertion and subject to attacks of palpitation, although he had but lately left the hospital as an in-patient and had been to a convalescent home for a month after that for his complaint. He was, in fact, *in statu quo*, or, if anything, rather worse. The case was called one of cardiac muscle failure.

He had been quite well and following his rather laborious work as a gas furnacer, which involved a lot of heavy shovelling, until the beginning of December, 1916. Some cough began then. He took medicine for this and worked on until December 20th. About this time he began to have a tightness of the chest and difficulty of breathing whilst wheeling his barrow; he could not go on with his work and, in fact, has not worked since. He has also had sudden attacks of palpitation which may last for an hour, not accompanied by pain, but occasionally associated with a stifling sensation over the front of the chest. All these symptoms had continued off and on until now. He was moderate in his habits. There was no history of rheumatic fever. Generally, he had had very good health.

Such was the history—an account such as might fit in with an attack of cardiac dilatation, either primary, or secondary to renal trouble, or perhaps indicate a period of so-called functional disturbance.

The chief feature, on examination, was the pulse. The heart showed nothing of note, nor was there any œdema or albumen in the urine. The pulse was regular and fast, 144 per minute; undoubtedly faster than normal, quicker, too, than one would expect it to be were it part of the symptom complex of a cardiac dilatation, with such trivial general signs of myocardial exhaustion as were here present. The acceleration of the pulse was not due to nervousness; the man was not that sort. There were no signs of thyroid disturbance. Yet there could be little doubt that such a tachycardia was not a chance finding, independent of his general condition. There was every reason to suppose that it was very clearly related to his cardiac condition, that it had been present, therefore, for four months, and that if we could find out the cause of the tachycardia we should know also the source of his heart trouble.

There was one remarkable feature about the pulse which gave the key to the condition; it was unusually steady in its rate. Whether the man stood up or lay down, or sat down; whether he held his breath or adopted forced breathing, the rate remained unaltered; it remained at *exactly* the same figure (36) for each successive quarter minute count.

This "mechanical" character of the heart rhythm was very suggestive; it is peculiarly characteristic, nay, almost diagnostic, of abnormal impulse formation in the heart, typified clinically, in the conditions known as paroxysma tachycardia and auricular flutter. What happens is that some focus in the cardiac musculature becomes more irritable than the rest, more excitable even than the sinus which normally regulates the cardiac rhythm, and therefore it sets the heart off at a rate controlled only by the rhythmic power of such focus. As long as this is the case, it controls the reins of government and the heart has now no chance of responding to the usual influences acting through the sinus, which at every turn, normally, modify and attune its activities to its environment. Thus is explained this mechanical character of the pulse. Experience has shown that the usual rate of such impulse formation in paroxysmal tachycardia is 120 to 160 per minute, in flutter 250 to 300 per minute. In the former case, supposing, as is most usual, that the irritable focus is in the auricle, that is, auricular paroxysmal tachycardia, the ventricle usually responds to each auricular systole. Where, however, the auricular rhythm is 300, what usually happens is that the conducting channels from auricle to ventricle are unable to meet the task of transmitting so many stimuli; there is, in fact, a partial block and it commonly only conducts every other impulse. Then the auricular rate is 300, the ventricular only 150. It is obvious that the case under consideration might be either of those conditions. A simple test gave us the clue to which it was; the man was asked to walk vigorously two or three times round the room. The pulse was then counted. It had fallen to 106 per minute and had become irregular. This practically never occurs in paroxysmal tachycardia; it is, however, a relatively common event in auricular flutter. The explanation need not detain us here, but briefly it indicates a temporary disturbance of conductivity in which now 2, now 3, or it may be 4 successive auricular beats fail to actuate the ventricle; a consequent showing and arrhythmia results. The diagnosis only remained to be confirmed by graphic means. The following electrocardiographic curve, taken soon afterwards at the Ancoats Hospital (Fig. 1), shows a typical example of auricular flutter, in which only every second auricular impulse passes on to the ventricle.

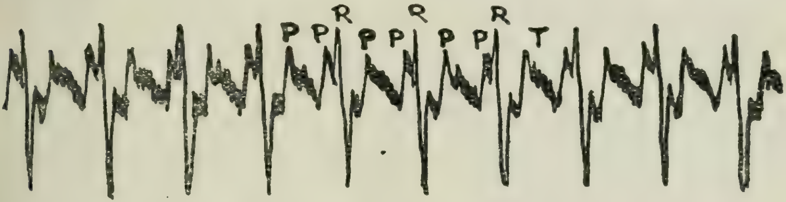


Fig. 1.—Explanation. *Auricular systole indicated by the wave* P, *ventricular systole by waves* R *and* T (*the latter is omitted for clearness sake*). *Two auricular beats to one ventricular. The* P *wave immediately following the* R *is superimposed upon the* T *wave. Ventricular rate* 150, *auricular* 300 *per minute.*

Treatment.—It is a matter of recent knowledge that digitalis in such cases may convert flutter into the next even more irritable condition, fibrillation. If then the digitalis is withheld, the heart frequently reverts back, not to flutter, but to its sound rhythm again. The explanation of this clinical fact is unknown. I put the patient on Tincture of Digitalis, ♏10, t.d.s., and gave him instructions to count his pulse once a day for me. At the end of a week nothing had happened; the pulse was still 148 and regular. I then increased the dose to ♏20. From that day circumstances prevented me from seeing the case for seven months, and I must fill up the gap with the man's own story told to me when seen again on November 22, 1917. After two doses his pulse fell to 28 per quarter minute (112), after the third to 18 (72). The patient then naturally became alarmed and himself stopped taking the medicine any more. But he felt much better soon afterwards, he resumed work, and has been doing full duty for the last six months. Fig. 2 shows the second curve taken on November 29. This is a perfectly normal tracing. The patient now looks quite well, and in the six months' interval has had no symptoms of any kind. We are unable to state exactly what happened under the big doses of digitalis, but there is no doubt that it was responsible for a sudden reversion of the heart's rhythm to the normal; with this effected, of course, recovery was uninterrupted and could be dated from that moment.

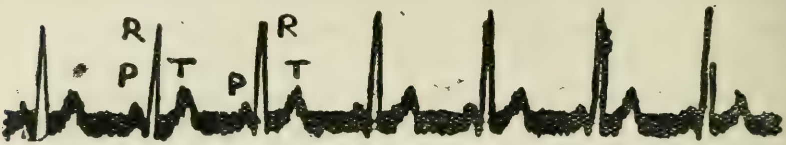


FIG. 2.—EXPLANATION. *Electrocardiographic curve taken November* 29, 1917. *Lead I. Time marker absent. Pulse rate,* 70 *per minute.* P = *auricular systole;* R *and* T = *ventricular systole. This is a normal curve in every way.*

A case such as this, not unique in any way and quite familiar to modern cardiologists, represents as clean-cut, satisfactory, and definite an instance of cure as we could desire. It is a particularly pleasing illustration of the value of modern methods, and is a commentary on the suggestion that such methods are interesting, scientific, and all that, but do not materialize at the bedside.

It is right to remark in conclusion, that not all cases of proved flutter respond quite so satisfactorily; there is a tendency to relapse; a few cases seem quite uninfluenced by drugs; others, especially the brief paroxysmal instances, give no time or occasion for systematic drug treatment. But the number of instances resembling the present reported case in which similar cures have been effected, is quite considerable and such as to make it of great practical importance to ensure, in the first place, their prompt clinical recognition, in order that so real a benefit may so easily be conferred.

◆

THE GERMICIDAL AND THERAPEUTIC ACTION OF GARLIC.

By W. C. MINCHIN, M.D.

Herstmonceux, Sussex.

There is probably no more valuable drug mentioned in any pharmacopœia than oleum allii, the active oil of garlic; yet, there is scarcely any so little known to our profession generally.

The medicinal properties of garlic have attracted the attention of those who have been interested in the therapeutic qualities of plants and herbs in all ages. References to its virtues in the treatment of tuberculosis can be traced back to 1,000 B.C., and almost continuously subsequently, it has been recommended by the best known herbalists of olden times in the treatment of this disease. In more recent times, it has been recommended by the late Dr. Poore (Univ. Coll., Lond.), Dr. Cavazzani (Univ. Venice), Dr. P. Piccinini and others for use internally in tuberculosis of the lungs. These authorities, however, appear to have only used the bulb and its derivatives internally, and do not seem to have recognized two extremely important properties of garlic oil, viz., (1) its great volatility; and (2) its very remarkable power of penetration when it is applied to the skin or to an ulcerated surface thereon.

Its extremely volatile constituents rank it amongst antiseptics of the first order, and make it of the greatest value in the treatment of pulmonary diseases by inhalation. Its great power of penetration allows it, when applied to any area of the skin or an ulcerated surface, to penetrate to the deepest tissues and bones in that region, thus saturating all the tissues in that part with oleum allii and permitting it to exert its antiseptic qualities in a satisfactory manner fully, without the need for tubes and such appliances to convey it to any sloughing part in the deeper tissues. Sloughing wounds must first be washed clean with any antiseptic, and then a dressing, subsequently described, is applied over the wound and surrounding skin, when usually the wound rapidly becomes healthy and heals. So quickly does it penetrate the unbroken skin, that if an application of garlic is made to any part of it, its active oil enters the blood stream, and can be detected in the breath by its odour in about 10 minutes. It penetrates all parts of the body, and is eliminated by the lungs, skin, liver, kidneys, lacteal secretions, and saliva.

Oleum allii is composed of allyl sulphide with volatile terpenes, and it would appear to be Nature's antiseptic for internal use, for it not only destroys many different germs of disease within the human body, but is harmless to the body tissues. In this respect it differs from all other known antiseptics of any great value. Any comparison of its germicidal power with that of carbolic acid, or other poisonous substances outside the body, is likely to be very misleading. The human tissues may be saturated with oleum allii, when properly administered either by ingestion or by local application, for a very considerable time, even constantly, without injury to them. That it is a prophylactic of some standing I may quote so far back as 1100 A.D., in "Regimen Sanitatis Salernitanum," addressed by the heads of the oldest European medical schools to Robert of Normandy, son of William the Conqueror. An old (anonymous) English version presents the following reference, writing of different herbs and fruits:—

> "But Garlicke chief, for they that it deuoure,
> May drink, and care not who their drink do brew,
> May walk in ayres infected euery houre
> Sith Garlicke then hath poure to saue from death,
> Bear with it though it make unsauoury breath."

In such diseases as typhus, typhoid, and diphtheria, which were likely to be found frequently in this country about that time, I believe that garlic did act as a prophylactic. When these diseases have already invaded the human body and have become established there, I strongly advise a trial of 1 drachm of fresh succus allii sativi every four to six hours in the first two diseases. It may be given in beef tea, or other such fluid, or with syrup. Children take it freely in syrup; half a drachm is sufficient for a child under twelve years. In typhoid fever, if given early, it acts in a most satisfactory way, almost aborting the disease. It is beneficial in any stage of the disease, and is the most satisfactory intestinal antiseptic which I know of. Dr. Cook has recommended its use in infantile diarrhœa. An application, such as is subsequently described, gives much satisfaction when applied to post-typhus, gangrenous conditions.

In the treatment of diphtheria, garlic acts better than anything else heretofore recommended. It is necessary to apply it with but little dilution; in fact, one of the best and most simple methods of using it is to instruct the patient to keep a small portion of the bulb in the mouth and occasionally to score it with the teeth in order to expel a little juice. This should be continued until the piece of bulb has been reduced to a pulp, when it may be swallowed and replaced by another piece. In three or four hours, from one to two ounces of garlic bulb may be used in this way. At the expiration of this time, sometimes before one can procure serum for injection, it is usual to find that all membrane has been removed from the tonsils, etc., whilst very often two large white moulds of the posterior nares, not unlike pigeon's eggs, have been discharged; the patient expresses gratitude for the decided relief; the temperature falls quickly, and becomes normal in a few hours. This treatment also is usually curative in those cases of diphtheria which have come under observation too late for serum to be of use to them. In short, it robs this disease of all its terrors. During the first four hours' treatment, it is not so much the amount of garlic used which is of the first importance, as keeping it constantly in the mouth, so that it may act as a local application. It is, however, necessary that an appreciable amount of the juice should constantly remain in the mouth during this time, for if it is insufficient in quantity it will take much longer to obtain the same result (12 to 24 hours). The fresh juice of garlic, diluted with an equal part of water, makes a suitable application, and will be grateful to those who find the bulb too hot. In the case of young children, this mixture can frequently be applied by means of a coarse spray.

It may be diluted with any fluid or, if prepared with jelly and dispensed in bottles sufficiently wide-mouthed to admit a teaspoon, a little may be taken frequently, and kept in the mouth as long as possible, when it may be swallowed and repeated. Two ounces of this 50 per cent. preparation may be taken during the first four hours but much less is usually enough. An overdose can scarcely be taken. A patient suffering from diphtheria can neither smell nor taste garlic, but merely finds it hot. Septic throats rapidly yield to the same treatment. The treatment of whooping cough had always appeared to me to be very unsatisfactory until I tried the effect of garlic. I find that in the cases of adults suffering from this disease, that an inhalation containing oleum allii, similar to that described in my book[1] for the treatment of pulmonary tuberculosis, rapidly relieves the distressing symptoms. It requires to be used more continuously than in the case of pulmonary tuberculosis during the first three days (from three to five hours daily). The inhaler which I use is a modification of Dr. Burney Yeo's, made by Messrs. Arnold and Sons, London, from my specification. The sponge of the inhaler should be freshened with inhalation every hour it is in use, and it requires to be washed once daily or it will lose its absorbent properties. In the case of infants and young children, 20 m. to half a drachm of the fresh succus allii sativi taken every four hours in syrup gives rapid relief in early cases. If treatment is begun late, results are not so rapid or satisfactory. Sydenham has advised that garlic should be applied to the feet in small pox. It is curious that this method of applying garlic is a favourite one, and I have seen it thus used by the natives in India for rheumatism.

TUBERCULOSIS.

This is the most difficult of all diseases upon which to demonstrate the value of the therapeutic action of any drug or serum. Even though we are in possession of a drug or serum, which will destroy tubercle bacilli within the human body, by no means every case of tuberculosis will yield to the application. On the contrary, many cases of tuberculosis which appear to be early and favourable ones run a rapidly fatal course, whilst many which seem to be quickly approaching death and far spent will recover completely.

---

[1] "The Treatment, Prevention, and Cure of Tuberculosis and Lupus with Oleum Allii."

Thus, in the hands of a practitioner who forms an opinion of the value of any drug or serum by its results in a small number of cases of this disease, we find the remedy either quickly thrown aside as useless or, having had unusual success with the few cases, it is lauded to the disappointment of others who were led to try it. This curious and puzzling state of affairs has, for many years, led from time to time to the recommendation of a host of remedies, all of which having failed in certain cases have been laid aside as useless, notwithstanding the fact that in some cases they have proved beneficial or even curative.

The explanation of this, I believe, is due to the peculiar nature of the tubercle bacillus, which must find in the tissues a quiet, even stagnant situation, so far as the blood stream is concerned, before it can begin its fatal operations. This bacillus is harmless whilst circulating in the blood before finding such a situation, and everyone must, from time to time, even frequently, be infected with it, in so far that it reaches the blood stream. When circulating in the blood stream, unless it drifts into a point where it becomes practically stagnant, it cannot settle down, increase, and flourish. A simple illustration of this is frequently seen in the case of a youth suffering from tuberculous osteitis of the tibia, which has followed a slight blow upon the part. It is easy to understand that the blow caused congestion, or even clot, which blocked the circulation in the finer blood vessels and capillaries, and so rendering the area stagnant; it only required the tubercle bacillus to be in the circulation to complete the picture. I believe that anyone who resides with a person afflicted with pulmonary tuberculosis under the ordinary existing conditions, which permit the sweeping of bacilli laden dust about the house, can readily demonstrate this upon himself. This bacillus in the lung appears to be able to find stagnant areas wherein to settle more readily in some persons than in others; and I think that an anatomical similarity would explain the special selection of many members of one family for its habitat.

This disease, then, once established, whilst within the tissues of the body, is outside the influence of the circulation; and, in its most simple aspect, any remedy used for the purpose of destroying the bacilli must be of a penetrating nature to reach the tissues in which the bacilli are.

When bacilli have established themselves in the tissues and outside the influence of the circulation, they flourish and increase either—

1. By extension to the surrounding tissues throughout a larger, often very larger, area;
2. By surrounding themselves with fluid, often intimately mixed with *débris* of gangrenous tissue, in which they increase, and excrete toxins which penetrate to the blood stream;
3. By a combination of these.

No. 1 is the condition in chronic cases.

No. 2 is the condition in acute cases.

If the bacilli are protected by fluid, it is useless to try and reach them through the circulation; the condition is a surgical one. Frequently this fluid exists in very early cases which appear to be favourable for treatment.

I suggest garlic not only as a cure for the disease as met with in No. 1, but also to differentiate between the two conditions.

If garlic, properly applied as described elsewhere,[1] does not cause a great improvement in a pulmonary or otherwise localized case of tuberculosis in a few weeks, we are dealing with a surgical condition.

In a localized tuberculous lesion other than pulmonary, such for instance as tuberculous osteitis, if we find no great improvement after a few weeks under treatment by garlic, surgical measures are indicated forthwith, and one of the following conditions will be found to exist:—

1. A sequestrum;
2. A mass of gangrenous soft tissues intimately mixed with pus;
3. A shut-away stagnant pocket of pus not necessarily large.

On removal of these conditions, garlic applications will be rapidly curative.

The staff of the Metropolitan Hospital, New York, working upon these lines, took on trial fifty-six modern treatments of tuberculosis over a period of two years in 1,082 cases, and generously confirmed my work. *Vide* Dr. Marshall Wm. McDuffie's paper in the special tuberculosis number of the *Interstate Medical Journal*, 1914, entitled "Medical *versus* Surgical Treatment of Tuberculosis from Observations in over one thousand cases." He says :—"*The treatments* studied in our work have been mercury succinimide, mercury bichloride, mercury biniodide, arsenic trioxide solution intravenously, salvarsan, Fowler's solution, mineralization treatment, oils, Sherman's vaccines (P), combined bacterial vaccines (Van Cott), mixed infection phylacogen, tuberculosis phylacogen, filtrates or toxins, Dr. Duncan's autotherapy filtrate, tuberculin, antistreptococcus serum, quinine, baptisia, formaldehyde solution intravenously, salicylic acid mixture intravenously, salicin, sodium salicylate, guaiacol, vanadium, creosote, 2 per cent. aqueous solution of pure carbolic acid, phosphoric, nitric, hydrochloric, hydriodic, lactic, boric, and aromatic sulphuric acids, Bannerman's solution, formula as per Bannerman's solution intravenously, saline solution intravenously, Murphy's drip, non-virulent tubercle bacillus vaccine, iodoform, iodides, *garlic*, phosphorus, paracentesis thoracis, thoracotomy, thoracoplasty, pneumotomy, etc.

"*Of these treatments, but two stand out* as regards anything like specific action upon the tubercle bacillus and tuberculous processes—that is, clinically speaking. They are garlic from the vegetable kingdom and mercury from the mineral.

"Garlic contains a volatile oil, called allyl sulphide, and its medical properties depend on this oil, strongly antiseptic, and it seems to have remarkable power of inhibiting the growth of the tubercle bacillus, eliminated by the lungs, skin, kidneys, and liver, and oxidizes into sulphuric acid in the system. Applied locally, it is freely absorbed by the skin and penetrates the deeper tissues. *Garlic gave us our best results*, and would seem equally efficacious, no matter what part of the body affected, whether skin, bones, glands, lungs, or special parts. Dosage used internally, one drachm of the expressed juice or two drops of the essential oil three times a day; externally, poultices of crushed bulbs, one part with three parts of lard, or unguentum garlic (50 per cent. juice in vaseline) applied daily. Healing is by new connective-tissue formation."

He also shows, with X-ray photography, an amount of the most valuable information as to when the surgeon must interfere. In fact, we now treat many cases by surgical methods, which in reality are medical cases, and *vice versâ*. It is a matter much to be regretted that Dr. McDuffie (New York) was at that time induced to abandon tuberculosis research for that of cancer, for I believe he had just arrived at conclusions which otherwise would have made clear this great problem before now.

The following experiment from the pen of Dr. Cavazzani (Professor, Univ. Venice), is unquestionably of the greatest significance, and adds further corroboration. It appeared in the *Lancet*, January 9, 1904 :—

" About the end of June, 1903, I took eight guinea-pigs, six of which had been submitted to a preventive treatment for a fortnight, each swallowing daily 0·6 gramme (1 grain) of garlic juice. After having dried and powdered expectorated mucus from tuberculous patients, I insufflated a small quantity of this material into the larynx of each guinea-pig. The animals so treated were kept for two days in a room impregnated with the same powder. Two guinea-pigs were kept as controls throughout the experiment. Three of the remaining six were given the above-mentioned quantity of garlic for a fortnight, and the other three were given a similar amount till the end of September. I killed the animals in the first week of October.

" The results of the necropsies were that the abdominal organs and the lymphatic system of the two guinea-pigs used for control were completely filled throughout with tuberculous formations in different stages of development. The microscopic examination of some tubercles proved the presence of Koch's bacillus. In the bodies of the three animals which had been treated with garlic for one month, I found from 10 to 20 small tubercles, some of them in the liver and some in the spleen. The examination of the tubercles did not reveal the presence of Koch's elements, but instead it showed the presence of numerous fibres of young connective tissue. In the bodies of the other three guinea-pigs, those which had been treated with garlic up to the end of the experiment, I could find no tuberculous formations, though the most minute examination was made. The small number of animals used in the experiment forbids the drawing of conclusions."

The fact has been frequently commented upon that, in many continental cities, it has been found that the death-rate from tuberculosis has been remarkably low in some of the most overcrowded and dirtiest slums. I think that the garlic-eating habits of the residents may be found to prove a sufficient explanation of this.

A similar explanation also may show why the death-rate from this disease amongst Jews in many parts of the world is particularly small, and may explain why, as time goes on, the death-rate from tuberculosis amongst Jews steadily rises. This is likely to be explained by the fact that garlic-eating amongst Jews who have been born in this country is seldom indulged in, nor do the higher-class Jews (of the professional classes) use garlic to any extent.

A short time before the war the medical officer of health of Croatia pointed out that in his opinion the longevity of the Bulgarians is due to their ingestion of large quantities of garlic, and not to their habit of using sour milk, as Metchnikoff had thought.

Professor Koch showed that a small percentage of allyl alcohol inhibits the growth of the bacillus anthracis. Garlic has a remarkable effect in neutralizing the poisons of stinging insects. Such dangerous symptoms as those brought about by wasp-stings in the mouth, accompanied by swelling of the glottis and surrounding parts, are best treated by chewing raw garlic, which rapidly relieves the symptoms and reduces the swelling. Ozœna and otorrhœa often yield to applications of garlic, when everything else has failed. A lotion of the strength 1–6 of succus allii sativi, in distilled water, is suited to this purpose. Foul ulcers, bed-sores, gangrenous and sloughing wounds are rapidly cleansed and made healthy by dressings with the succus at a strength of 1–4 with distilled water, or an ointment 25 per cent. to 50 per cent. with vaseline. This dressing applied to gangrenous wounds will stop the gangrenous process, and thereby will frequently save a limb. Similar dressings applied to a stinking and painful cancer will cleanse and deodorize it and free it from much pain, but it will not cure it.

Good results are obtained from applications of this 50 per cent. ointment in cases of anthrax, carbuncles, and boils. Oleum allii is indicated in any septic condition, and has given splendid results in septic pneumonia; *vide* letters recently in the medical press from Drs. Walter Garman and MacCloskey. Garlic acts beneficially in goitre, probably through its action as an intestinal antiseptic. Major R. McCarrison has pointed out that an intestinal antiseptic is necessary. I can recommend oleum allii for this purpose in ♏ii capsules, or ʒi of the succus t.i.d.

An excellent dressing for burns is made by the addition of 20 per cent. of filtered succus allii to carron oil.

Garlic has been recommended in many other conditions as a stimulating expectorant, anthlemintic (round and thread worms), vesicant, carminative, and antispasmodic. Its vesicating action is not unlike that of mustard, the beneficial action of which may be due to the absorption of its allyl oil. Garlic is an excellent remedy in capillary bronchitis, fœtid bronchitis and bronchiectasis, and in some forms of asthma. Any substance, recommended for general use in so many diseases, must be looked upon with an amount of incredulity by the profession. I would, however, recommend its trial in the strongest terms, and in doing so I repeat that it is harmless. The ingestion of garlic causes some biting insects to avoid those who take it, notably ticks. This should make it worthy of the notice of the veterinary profession, for many diseases in the lower animals have been attributed to the bites of ticks.

REFLEX PHENOMENA PRODUCED BY COMMENCING ABDOMINAL HERNIA.

By W. B. COSENS, Major R.A.M.C.

Medical Officer in Charge, Prisoners of War Hospital.

Reference to text-books gives little or no information on this subject; in fact, I have been unable to find any description of symptoms preceding the actual presence of a hernia.

The examination of over 19,000 English and German soldiers enables me to write with some degree of positivism, for I have seen a large number of cases, and have watched their after-treatment.

The "appendix dyspepsia" of Moynihan is an accepted fact, and has served as a hint to other abdominal reflex phenomena, which appear at their maximum degree of intensity amongst men, whose nervous systems have been sorely tried with the sudden strain on muscles little used to physical exercise.

The following *symptoms* are complained of, and I have seldom heard of any feeling of discomfort below the level of the umbilicus. In their order of frequency these are: an uneasy feeling in the epigastrium, but not actual pain; discomfort of a "dragging" character referred to one or other costal margin, or its immediate neighbourhood; pain in the back, corresponding to the ninth and tenth ribs; a feeling of nausea, but no vomiting; and, often, constipation.

Physical signs in abdomen are almost nil. Sometimes the skin appears more sensitive on one side, and there is, perhaps, slight tension over the upper segment of one rectus. The ordinary signs and symptoms of dyspepsia are practically absent; in fact, if no leading questions are put, the information given amounts chiefly to discomfort and slight girdle pain on the line of the cartilages of the tenth and eleventh ribs. Having satisfied myself that the condition of the viscera above the level of the umbilicus are normal, I request the patient to stand up with his heels together, and to look upwards. I then apply the thumb of my right hand to his left internal inguinal ring, and that of my left hand to a similar position on his right side, and making equal pressure, I watch his expression. He often gives a slight wince, and when I ask "why," he invariably replies, that there is tenderness over one or other rings, on the same side as the symptoms he has described as existing above the level of the umbilicus.

To arrive at a correct diagnosis, it is important not to ask if there is pain—let the information come from him.

The anatomical explanation appears to me perfectly simple; the splanchnic plexus, situated for the most part on and near the crura of the diaphragm, supplies the intestines, whilst the muscles of the abdomen are supplied by the lower costal nerves.

Treatment.—A lightly applied truss will clear up any question of diagnosis, and a radical operation has been sought for in many cases coming under my observation.

The phenomena of reflex symptoms, in other words, of clinical observation, are being lost sight of by the younger generation of practitioners due, to some extent, to the reliance they place on the report of the bacteriologist. But no more valuable information can be obtained than, when pressure in the right iliac region produces a shooting pain in the epigastric region; from pain on the inner side of the left knee in malignant disease of the pelvis or transverse colon; from the shooting pain in the upper pelvic colon in an inflamed hæmorrhoid above the sphincter area; from the laryngeal cough due to cerumen in the external ear; from the boil on the pinna and uneasiness in the epigastrium; and from adenitis of the deep cervical glands and a sluggishly contracting iris.

In my opinion, a bubonocele is the *second stage* in the advent of a hernia; *the first* being the symptoms I have re-corded, whilst the hernia or *third stage* is the outward sign of neglect on the part of the patient, or of failure of the surgeon to recognize early phenomena.

The reflex phenomena of commencing inguinal hernia being no less extraordinary and requiring only interpretation, it seems little to our credit to see so many herniæ fully developed. Preventive surgery is equally as great as the active performance of our art, and though perhaps less satisfying to the individual surgeon, is certainly more to the comfort of our patient.

I.

NEURASTHENIA PURA—ITS ÆTIOLOGY, SYMPTOMATOLOGY, AND PATHOGENESIS, WITH SPECIAL REFERENCE TO THE PRODROMAL PERIOD OF THE DISEASE.

By S. H. BENNETT, M.D., Ch.B.

INTRODUCTORY.

> " Physicians who pass by the obscure phenomena of the nervous system as unworthy of their notice, may be reminded of this, that modern science in all its branches, and particularly in biology, is constructed out of slight, trifling, and unnoticeable facts and phenomena of nature."
> —(*Beard.*)

THERE is no more distressing malady in the whole realm of medicine, nor yet one less adequately understood and therefore more improperly treated by the generality of medical practitioners, than that very prevalent and ever-increasing functional disease which has been designated *neurasthenia.*

It is regrettable in the extreme, and from the point of view of the public weal a matter for much concern, that a disease which appears to be a product, or at least, a concomitant of the bustle of modern civilization, and which claims so many victims among the population, should have so little attention bestowed upon it, even in the medical lecture-halls of our universities. In these it is seldom, if ever, dwelt upon at any length, certainly never with the importance it deserves, although it can not infrequently be heard referred to, alike by teachers and practitioners of medicine, in language that too obviously reflects how little appreciation or knowledge of the terrible nature of this affliction is possessed. It is, indeed, to me most perplexing why more interest or study should be devoted to, say, an organic disease like pneumonia, which often tends, even without much therapeutic interference, by the reaction processes of the body, towards natural and speedy abortion, than upon a functional disorder, equally as prevalent, which can, and too often through inadequate treatment does, spell months, nay, years of indescribable misery and torture to its victims, and which, moreover, in the absence of efficient treatment will invariably persist, or become progressively aggravated.

The reason for this is quite apparent. The teacher of medicine, having such an extremely wide field of medical science for his speciality, and his clinic practically consisting wholly of cases presenting demonstrable pathological processes, dependent upon organic disease, for his consideration, comes to regard functional disorders as of little or no value from the clinical point of view; though, be it said, a typical neurasthenic could scarcely muster the courage to enable him to stand for a clinical lesson. Anyhow, students are perpetually asked by their teacher to discuss or observe with him diseases of organic origin, to recognize their pathological significance, their symptoms or manifestations, and so on. Functional diseases they have neither heard discussed nor have they had the chance to observe. They thus naturally carry with them into public life that disinterestedness in, and apathy for, handling functional disorders—commensurate with their ignorance of the real nature of these—which was acquired in the lecture-room or hospital atmosphere.

The result is that the neurasthenic meets with but scant sympathy from the average physician he consults; his symptoms, very real to him, are either made light of or ignored by the physician, who has come to regard as real, and therefore as worthy of his careful consideration and attention, only symptoms or syndromes which point to the more or less definite existence of an organic lesion or lesions. The symptoms of the neurasthenic to him, therefore, are unreal, merely figments of the imagination, and he usually disposes of his patient by telling him he is nervous or neurasthenic (using both words in a synonymous sense and, therefore, wrongly), and by way of treatment prescribing a bottle of medicine containing "bromide," or advising a holiday in the country, a sea-voyage, or, perhaps, more frequent visits to the jovial (yet not unexciting) atmosphere of a music-hall. The patient may consult a dozen physicians and get the same satisfaction from each, until ultimately the feeling grows upon him, and quite legitimately so, that his malady is not sufficiently understood, and that the physician is of little or no avail.

It is quite time that this disease should be better understood, and approached with a deep sense of the extreme suffering its victims have to undergo. Our enthusiasm to interest ourselves in, and understand the nature of, any disease should always, *inter alia,* be commensurate with the amount and degree of suffering for which that disease is responsible.

The writer has encountered, in his private practice, a series of cases of neurasthenia; these were studied in each instance with great interest, care, and patience, as well as with a whole-hearted sympathy for the depth of misery that was invariably complained of. The reward has been, I believe, a better understanding and appreciation of the nature of this malady, and how to treat it most effectively. The facts elicited on very careful inquiry into the history of the patients suffering from neurasthenia, that came under my observation, lead me to the conclusion that much obscurity and confusion still exist concerning the real nature of neurasthenia; that its prodromal period, almost always of long-protracted duration, which I have ventured to designate "the pre-neurasthenic state," has not hitherto been clearly recognized and differentiated from the typical and well-defined syndrome, which neurasthenia itself undoubtedly is; and that the precise causation of the disease has not yet been truly stated.

The present article is an embodiment of my observations on neurasthenia, and constitutes a minute, and, so far as the exigencies of general practice would permit, a fairly comprehensive inquiry into the nature of that disease—its ætiology, pathogenesis, and symptomatology. In these catastrophic days, neurasthenia has assumed more than ordinary importance, which is evident in the wise recognition by the army authorities, that men formerly discharged the services for this disease are not recallable under the latest Military Services Acts, and by the institution, I believe, of segregated and distinctive treatment for neurasthenic cases. But the lethargic interest in neurasthenia displayed by the average practitioner, and his jumbled and meagre conception of it in pre-war time days, render a minute survey and elucidation of its exact nature, at a time like this, all the more opportune and desirable. In a subsequent article, I hope to advocate a method of treatment that I have found to be more specific than any in general vogue for the relief and " cure " of the sufferings from this terrible affliction.

DEFINITION OF NEURASTHENIA.

Eulenburg defines neurasthenia as a " widely distributed, extremely chronic, neuro-psychosis, which is chiefly characterized, clinically, by pathological disturbance in the equilibrium of innervation and by changing relations between the sensory and motor, as well as between the higher cerebral (psychic) neuron systems which bring about association, these pathological disturbances being nosologically revealed by extreme irritability of the sensory and psycho-sensory neuron systems, and excessive exhaustion of the motor and psycho-motor (intracentral) neuron systems."[1]

This definition—the best I have come across—I regard, as far as a definition can be, as being a fairly comprehensive *résumé* of the characteristic and leading symptoms of the disease. The expression " irritable weakness," in reference to nerve functioning, employed by Savill[2] and others to define neurasthenia, is, in my view, but empty phraseology, unjustified by clinical considerations, or by any known pathological data; it would be better to substitute the phrase " aberrant functioning " for " irritable weakness," or " extreme irritability " in the definition quoted, since it characterizes the state of the nervous system in neurasthenia, if not from the pathological, at least from the clinical aspect. The word " neurasthenia " has acquired quite a popular and commonplace use nowadays among the profession, but it is employed almost invariably in the loose sense of nervousness, or as a " rag-bag for heterogenous collection of nervous symptoms of complex causation," but seldom to comprehend the distinct entity embraced in the foregoing definition.

It is important, at the outset, to draw a distinct line of demarcation between neurasthenia and what is ordinarily called nervousness. We say that a person is of a nervous temperament, who exhibits a special susceptibility to pain, to emotional excitement, or whose sensorial impressions from unpleasant or unexpected stimuli cause undue fear or anxiety. The word "nervous" thus refers to a quality of nerve tissue, which, in most cases, is inherited. As we all differ in the quality of nerve tissue we possess, the term "nervous," when applied to the temperament of individuals, cannot be regarded as denoting a physiological aberrancy. It is a characteristic of nerve tissue to be responsive, so that a hyper-responsiveness of nerve tissue in any given individual need not imply disordered nerve function or a pathologically acting tissue, since for that individual the nerve responses are expressive of the quality of his nerve tissue.

"Nervousness" is perfectly compatible with a soundly working constitution—well-regulated metabolism, undisturbed mentality, and general wellbeing. That is the point I desire specially to emphasize. The intrinsically nervous person may be quite capable of great efforts, intellectual as well as physical, and may thus be a perfectly useful citizen. He can toil with impunity, earn his own living, and find happiness in the pleasures of life, differing from his stronger-nerved brother solely in respect that exciting, unpleasant, or unexpected stimuli produce much greater and more lasting perturbation of his peace of mind. We are, most of us, nervous in greater or lesser degree; hence, to regard neurasthenia as even an extreme degree of nervousness is to suffer the implication that the majority of the population are potential neurasthenics.

This, I stoutly maintain, is not the case. Neurasthenia is not an extreme degree of nervousness. The former implies what is popularly, though vaguely, conceived under the expression "nervous breakdown"; it is a disease, a symptom-complex or syndrome (of which nervousness may only be one of the many symptoms), which presents a series of morbid phenomena, and which transforms its victim into a more or less useless member of society. The pleasures of life are no longer for the neurasthenic, work he performs with difficulty or not at all, and he becomes a veritable burden to his household and himself as well. In the following pages I propose to use the word "neurasthenia" and its adjective "neurasthenic" always strictly in its specific sense, that is, in reference to the syndrome embodied in our definition. Indeed, the expression "neurasthenic syndrome" would, to my mind, have a more legitimate sanction than "neurasthenia," in that it would admit of less laxity of use or conception. Having defined neurasthenia and dwelt at some length on the difference between neurasthenia and nervousness, which even recent writers on neurasthenia are prone at times to employ synonymously, let us establish the precise mode of onset of the disease and its manifestations from its earliest beginning.*

It is generally acknowledged by writers on the subject that neurasthenia takes a long time to develop, but, so far as I am aware, the existence in practically every case of neurasthenia of a prodromal period characterized by significant and well-defined morbid phenomena, and the causal relationship of these morbid manifestations to the actual disease, have not hitherto been sufficiently understood or recognized. I have invariably found that to elicit an accurate and detailed account of the morbid happenings, and more especially to ascertain the precise sequence of occurrence of these happenings, both during an attack of neurasthenia and during the long prodromal period that precedes it, it was necessary to cultivate and win the absolute confidence of the patient by showing a profound sense of sympathy for and interest in his condition, for the neurasthenic, more so, perhaps, than any other class of patient, knows, and rightly so, that many of his distressing symptoms, if voluntarily told, would form a source of ridicule and belittlement to the average physician. But careful attention to details is imperative to enable us to arrive at a correct symptomatology, and to determine accurately the precise sequence of the morbid events.

THE PRODROMAL PERIOD OF NEURASTHENIA OR PRE-NEURASTHENIC STATE.

Neurasthenia is almost invariably preceded by a long prodromal period, which I venture to dignify by the name of the "pre-neurasthenic state." What is the morbid picture that characterizes and justifies the distinctiveness of this precursory state?

---

* For consideration of space a citation of cases illustrative of neurasthenia in its various phases is purposely refrained from in this article.

Firstly.—There is an incessant feeling of self-consciousness, which is a source of intolerable discomfort to the patient; he cannot speak to a friend, male or female, without blushing or experiencing a sense of embarrassment, so that whilst he does not wish to shun company, and, in fact, may seek it, it produces considerable mental upheaval or excitement and subsequent mental exhaustion, as well as neuro-muscular fatigue. The blushing, from its excessive frequency, must be regarded as pathological; but though an exceedingly common, it is not an absolutely invariable, accompaniment of the self-consciousness of the pre-neurasthenic. Every day lived through produces its quota of mental disturbance, so that as time goes on mental fatigue becomes more and more easy of inducement. These psychic disturbances, I maintain, occurring daily for years, pave the way for the neurasthenia proper which may ultimately supervene. In those who develop an attack of neurasthenia in middle or later life, self-consciousness usually takes the form of morbid introspection, and shyness may not be conspicuous or even characteristic.

Secondly.—Constipation is present in a proportion of cases, and may be very obstinate in some. Shreds of tenacious mucus are usually passed with hard masses of fæcal matter. Sometimes on attempting to defæcate, shreds of tenacious mucus alone are expelled. The mucus in these cases is probably due to the irritant effect of stagnant scybala on an atonic bowel wall, causing an excessive secretion from Lieberkühn's glands (" membranous enteritis "). In the course of time, an active catarrhal condition may conceivably be, and very likely is, superadded to the atony. Dyspeptic symptoms sometimes occur, and gastric flatulence is very commonly met with; these probably either result from the bowel condition or, when constipation is absent, are dependent upon the psychical upheavals. The stomach symptoms may be accompanied by a feeling of pressure and fullness after meals in the stomach region, but never by actual epigastric pain.

Thirdly.—Headache occurs in nearly every case, and may be the symptom, once developed, that most seriously perturbs the patient's wellbeing. As a rule, it is of the type described by Charcot as the "*casque neurasthénique*"—the sensation of a tight-fitting helmet pressing on or constricting the head (helmet headache). There is, in addition, an accompanying sensation of warmth. The headache is usually dull and oppressive, seldom painful, and generalized all over the top of the head. A band passing through a point about an inch above the external occipital protuberance posteriorly, embracing the temples laterally, and passing through a point about an inch-and-a-half to two inches above the eyebrows anteriorly, fairly accurately delimits the area of the crown of the head where this headache is felt. I have elicited the fact that considerable, though temporary, relief is often obtained by the patient pressing with one or both hands on the crown of the head, or when breezes of cold air pass over the uncovered head. Sir Clifford Allbutt similarly observes that placing a pad at the back of the chair to support the head often relieves the headache.[3]

Less commonly the headache is felt more intensely at some special situation, *e.g.*, in the occipital or in the frontal region. This pre-neurasthenic headache is practically always persistent throughout the waking hours, and is of more or less uniform intensity throughout the day, excepting that in the mornings the headache begins, not at the moment of awakening but when the patient gets out of bed and begins to walk about. Excepting then, however, the recumbent posture affords but little relief. The headache is invariably aggravated by any effort mental or physical, however trivial, or after emotional embarrassment or excitement. Often it constitutes a most distressing and obstinate symptom, although it is never so severe as to keep the patient awake at nights. Owing to the intolerable character of the headache, the faculty of concentrating the mind on anything requiring mental effort suffers considerably.

Fourthly.—There are pains and aches which affect the back, chest, and limbs. Most frequently, they occur along the spinal column—rachialgia, a form of spinal irritation of the older authors—and in character are either dull and boring or sharp and shooting. The most favourite situation of this rachialgia is in the region of the last cervical vertebra or of the thoracic vertebræ. As a rule, it is diffusely felt, less commonly it is localized to a limited area. Sometimes, it takes the form of a vague discomfort or stiffness along the region of the whole of the cervical vertebræ, or there is a sense of pressure and heaviness, as if a weight was being supported in the same situation or elsewhere along the vertebral column. Accompanying the rachialgia and aggravating it, there may be actual hyperæsthesia of the skin over the spine, the so-called spinal tenderness, but it is not true, as most authors affirm, that actual tenderness to pressure over the spine usually exists. Tenderness on tapping over the spinous processes is not usually present, and, if it can be elicited, is never very severe. The rachialgia and other pains are only of occasional occurrence, but they constitute a source of considerable worry and fear to the pre-neurasthenic; he imagines they are the expression of serious internal organic disease, undiscoverable by the physician, and, as a result, he becomes morose and introspective.

Fifthly.—There is a gradually increasing tendency towards neuro-muscular fatigue on exertion, or even after gentle exercise, such as walking short distances.

Sixthly.—The tendon reflexes, especially the knee jerks, are exaggerated.

Seventhly.—The temperature is, as a rule, subnormal, and cold hands and feet are a common complaint. It may be noted that during the pre-neurasthenic state the memory does not suffer impairment as a rule, and sleep remains undisturbed.

Mention may be made here of a symptom, which I have not seen described anywhere, but which may be encountered in the pre-neurasthenic state, especially after that has been in existence for some considerable time, though much more commonly during an actual attack of neurasthenia, as well as in healthy people of "nervous" temperament. It is this: often, on retiring to bed, and feeling very much inclined to sleep, the patient, instead of passing into the unconsciousness of sleep, falls into a subconscious state. Whilst in this condition, he is fully aware that he is not asleep; he is anxious to get out of it, and wants to shout for help, but finds himself deprived of the power of speech. Whilst it lasts, the mental agony the patient passes through is indescribable, his most distressing fear being that he will never be able to awake. He endeavours to "wriggle" out of this state—I use the word "wriggle" because the patient experiences the sensation that he moves his body, and especially his head, in the attempt—and eventually, by some sort of mental effort, he manages to pass into the conscious state again. The patient may now feel very sleepy, but the fear of passing again into this subconscious state may actually prevent him from trying to fall asleep, in spite of his sleepiness. He may, however, again try to fall asleep, and again pass into this subconscious state. This may even occur four or five times in succession, though, usually, when the patient has had two experiences of this in one night, he is so terrorized that he may not get out of this state, if he again passes into it, that he will get out of bed, or do his utmost to keep awake in bed. As a rule, however, in spite of his efforts, he will ultimately fall asleep normally. Again, the phenomenon may occur reversely. The patient may fall asleep in the natural way, but in the morning, instead of awakening into the fully conscious waking state, he passes into the subconscious state already described, and ultimately into the waking state. The phenomenon, which I take to be a *momentary trance*, lasts, so far as the patients can judge, about a minute or so. Whilst, in itself, of no serious import, the phenomenon is of sufficient significance to be recognized and its meaning understood. Beard states that some of his patients suffered from convulsive movements, being "suddenly and painfully awakened by a violent spasmodic movement of an arm or leg or of the whole body."[4] This is the nearest approach I have read to the phenomenon of momentary trance just described.

The foregoing constitute the morbid manifestations characteristic of the "pre-neurasthenic state." Regarding their frequency of occurrence, the hyper-selfconsciousness, with its implied emotional disturbance, is almost invariably present in every case of neurasthenia for years, directly preceding the onset of an actual attack; I have never failed to elicit its existence. I am here speaking of pure neurasthenia, and not of the many neurasthenoid states which constitute the prodromal period of various psychoses, such as melancholia; or which may result from the abuse of stimulants and drugs (*e.g.*, alcohol, tobacco, opium); or which come under the category of neurasthenia symptomatica—*i.e.*, asthenia of the nervous system accompanying and dependent upon other diseases, *e.g.*, disturbances of the nervous system which may occur in (*a*) diabetes; (*b*) chlorosis and the various other anæmias; (*c*) organic disease of the stomach or bowel; (*d*) phthisis; (*e*) conditions in which the processes of nutrition are gravely interfered with, such as carcinoma; (*f*) toxæmias due to infection, or metallic poisoning from mercury, lead, etc. In all these conditions, the nervous disturbances do not conform to the symptom-complex of pure (functional) neurasthenia; they are of a neurasthenoid character, and merely symptomatic of one or other of the diseases enumerated.

Of the other associated morbid phenomena, the rachialgia, the tendency to neuro-muscular fatigue on exertion, and exaggerated tendon reaction, are practically never absent. The headache is almost always present. The alimentary derangement is exceedingly common, but in some cases it is inconspicuous, or even absent. The headache and alimentary disturbance (constipation, etc.), often co-exist, but occasionally one is present without the other.

Concerning the time incidence and sequence of occurrence of these manifestations, the hyper-selfconsciousness, with its accompanying emotionalism, is the first and fundamental symptom; its origin can often be dated back to the period of puberty. In some cases it is an inherited proclivity, and may show itself even earlier, but it distinctly manifests itself in most cases, at least, from about the age of fifteen or sixteen and onwards, when the mental and, therefore, the emotional faculties commence to mature more rapidly, and the system generally is subjected to its maximum developmental strain. It is present throughout the entire duration of the pre-neurasthenic state. After the lapse of months, or years, the alimentary derangement develops, and, concomitantly with it, or succeeding it, the pre-neurasthenic headache appears. Then come the easily-induced neuro-muscular fatigue and exaggerated reflexes, and, lastly, towards the termination of the pre-neurasthenic state, and always foreboding the approach of an attack of actual neurasthenia, the rachialgia supervenes.

The pre-neurasthenic state usually lasts for years; it may terminate with the death of the patient who may thus live and die a pre-neurasthenic, or it may suffer temporary recoveries and relapses; but the usual termination is in an attack of true neurasthenia; such factors as environment, sphere of life, position, heredity, etc., will naturally influence the sequela in any individual case. During the pre-neurasthenic state, in spite of the discomforts from which he suffers, the patient can discharge his duties to himself and to others; in other words, he remains a useful citizen, more or less. With the advent of true neurasthenia, however, usually ushered in more or less suddenly by some cause or causes, always intrinsically mental in origin, there develops a well-defined and unmistakeable set of symptoms or syndrome, which makes the patient's life a veritable hell upon earth, rendering him more or less incapable of following his usual occupation and pursuits. I will now describe, in detail, the symptoms which make up this syndrome.

THE NEURASTHENIC SYNDROME OR THE SYMPTOMATOLOGY OF ACTUAL NEURASTHENIA.

The clinical picture of typical attacks of neurasthenia is as well-defined as that of other nervous diseases. For though we are dealing with a malady, the manifestations of which are mainly subjective in nature, the close resemblance and agreement of independent descriptions by individual patients are so striking, that the morbid entity, when we meet with it, should never escape recognition. I may state, at the outset, that, contrary to the view universally entertained, I hold that headache is not a usual, or, at least, a prominent and, therefore characteristic, symptom or stigma of actual neurasthenia. Why it invariably figures among the stigmata of neurasthenia, is, I maintain, due to the fact that the prodromal period of neurasthenia has hitherto not been sufficiently differentiated from the actual disease itself. I have observed, in most cases, that with the precipitation of an attack of actual neurasthenia, the "pre-neurasthenic" headache when present, either disappeared altogether, or became so distinctly mild or attenuated in character as seldom to form the subject of much complaint. With the exception of the headache, however, the other pre-neurasthenic symptoms persist, usually with increased severity, throughout the attack of actual neurasthenia. The symptomatology admits of a simple classification under certain headings.

A.—Mental or Psychical Disturbances.

(*a*) *Hyper-selfconsciousness and introspection*, which are even more pronounced than during the pre-neurasthenic state, associated with intense emotional excitement. In many cases, blushing of the face is of very frequent occurrence. The hyper-selfconsciousness often so dominates the patient's mentality as to render it well-nigh impossible for the neurasthenic to indulge in conversation with strangers, or even with friends, for any length of time; if he attempts to do so, he becomes immediately overwhelmed by sensations of a most intolerable character, all expressive of psychic instability, such as, for example, a feeling that his heart will stop beating, or that he will die if he cannot escape the conversation, and these are often accompanied by actual syncopal signs and symptoms, Hence, the neurasthenic will often bolster up an excuse for breaking off a conversation, and suddenly and abruptly leave the person spoken to, seeking appeasement of his misery in the serenity of solitude. For the same reason, the neurasthenic deliberately avoids theatres, assemblies, and the company of strangers. The emotional excitement which is present, is manifested, *inter alia*, by patients starting readily on the slightest provocation (*e.g.*, on hearing a voice unexpectedly, a ring at the door-bell, or a knock at the door, however gentle), and sometimes by a varying degree of restlessness. The self-consciousness leads to a decided tendency to introspection, depression, and worrying over small matters, the physiognomy being in keeping with this morbid mental state.

(*b*) *Cerebral fatigue* manifests itself by (1) a weakening of the memory, which in some cases at times amounts almost to total loss; (2) enfeeblement of the will or aboulia, which is evidenced by considerable irritability of temper, often provoked by the most trifling causes, and exhibited especially towards the nearest and dearest relatives; (3) a definite diminution in the capacity for sustained intellectual effort, that is, the power of voluntary attention, which requires the exercise of the will and judgement, is impaired. The faculty for spontaneous attention, however, is only slightly affected as a rule, so that a patient can, and occasionally does, participate in simple pleasures, such as laughing at or enjoying a joke, singing, and so forth. It is this fact, indeed, coupled at times with the maintenance in many patients of a perfectly healthy appearance and unaltered physique, that serves to engender suspicion as to the reality of their sufferings in the minds of relations and friends, and even to alienate their much-needed and comforting sympathy; (4) the presence of morbid fears or dreads—phobias or panics as they are called. The commonest of these are agoraphobia (the fear to be in open places), claustrophobia (the fear of being in a narrow or confined place, *e.g.*, a room or a railway carriage compartment), anthrophobia (the fear of company), the fear of being too far away from home, the fear that recovery will never occur, the fear that death is momentarily a probability, the fear that the heart will fail or "burst" (in cardiac neurasthenics), the fear experienced on retiring to bed at night to fall asleep lest death should occur during the unconsciousness of sleep, nosophobia (the fear of catching disease), etc.

It may be noted, however, that actual delusions or hallucinations never occur in pure and uncomplicated neurasthenia, and further, that the neurasthenic, although he very often talks of committing *felo de se*, even going the length of lifting a knife to carry out his threat, never really contemplates suicide; for, despite his extreme sufferings he values his life and is very anxious to recover. He is, moreover, too much of a coward to face death, and his threats are only an expression of his awful misery, and are usually made so as to impress his household with the reality of his affliction, and to enlist or retain their sympathy. Dowse remarks,[5] "it is not an uncommon thing for my patients to express the idea that their lives are so wearying, so distressing, so full of vague fears and dreads, so hopelessly intolerable, and yet in the same breath, they are specially anxious concerning the future. 'I don't think I shall ever get better,' followed immediately by 'you are quite sure that the medicines you are giving me will not injure my constitution' are remarks frequently made to me in the same breath. This is but one feature of the inconsistency which is so common in neurasthenia." I have experienced similar remarks to those just indicated from my patients time and again, but I can hardly agree with Dowse that they prove inconsistency (a symptom, by the way, which I have not found to be characteristic of the neurasthenic state), since they merely indicate the patient's desire to live on, that the hope of cure "springs eternal in the human breast," however intolerable life may be, and however gloomy the prospects of relief or recovery.

B.—Neuro-muscular Asthenia.

Neurasthenics suffer from easily provoked and sustained fatigue on exertion, or after exercise, however gentle, the asthenia being much more intense than that occurring during the pre-neurasthenic state. The grip is often somewhat weakened, especially in women; it may be normal to begin with, but successive tests with the dynamometer soon records the phenomenon of ready exhaustion. The neuro-muscular weakness, whilst more or less general, is specially referred to and complained of in the legs. The fatigue of the neurasthenic, be it noted, is much more lasting and more readily induced than ordinary fatigue; in other words, the same stimulus will produce fatigue more rapidly and more sustained in neurasthenia than in health. The asthenia varies in intensity from day to day, as well as during the course of each day, being dependent upon the degree, nature, and frequency, of the psychical upheavals that harass the patient's mind. Actual paralysis, however, never occurs in neurasthenia. As an expression of the muscular fatigue and nervous instability, tremors and twitchings commonly occur; they may be seen (*a*) in the hands, by making the patient stand erect with outstretched hands and fingers, as a fine tremor consisting of short, rapid, rhythmical, oscillations closely resembling those observed in exophthalmic goitre, or (*b*) as a quivering of the eyelids due to spasmodic twitchings in the orbicularis palpabrerum, or (*c*) as recurring irregular twitchings in small bundles of fibres in the muscles of the face, trunk, chest, and extremities. Partly, perhaps, as an associated phenomenon of the neuro-muscular asthenia, and partly, possibly, as an expression of vascular disturbance, pains and aches of various kinds may occur anywhere in the body, as well as the rachialgia already alluded to.

C.—Disturbances in the Circulatory Apparatus.

(*a*) *The Heart.*—The nerves of the heart, like the other nerves of the body, usually suffer in the general nervous hyper-excitability which is present. Palpitation is, therefore, a very common complaint ; sometimes it is very intense, and constantly present throughout the waking hours. Emotional excitement, physical exertion (however gentle) or change of posture (especially rising up from the sitting position) usually aggravate it. Associated with the palpitation there is tachycardia; this is paroxysmal in character, being dependent upon the frequency of the psychical upheavals. As these *bouleversements* recur often, palpitation constitutes, in many cases, a most distressing complaint indeed. The cardiac action, during the paroxysms, is, as a rule, regular in force and rate. The cardiac nerves and musculature are perpetually working overtime, so to speak, with the result that there may be constantly present in neurasthenics (especially and always in cardiac neurasthenics) a feeling of extreme weakness, dull aching, or fatigue in the præcordial area The persistent palpitation, tachycardia, and resulting cardiac discomfort, engender the belief in the mind of the patient that he is the victim of serious organic disease of the heart, and even when the assurances of the physician to the contrary dispel that erroneous belief, the patient often cannot be convinced, that because his cardiac disturbance is functional in nature, it cannot cause death. From this develops the fear that his heart will some day fail him, that he will die during a paroxysm, and the fear is all the more intensified, as time goes on, because the paroxysms may sometimes, in the absence of adequate treatment, partake of the nature of flutterings of the heart, during which the beats may be so feeble and hurried as to be almost imperceptible. These circulatory disturbances are present in varying degrees in practically all neurasthenics ; in some they are mild, in others severe, in others, again, they constitute the dominating features of the case (cardiac neurasthenia). Gilbert

Ballet holds[6] that neurasthenic tachycardia is habitually observed in those cases of nervous exhaustion in which the cerebral depression is profound, and in which intense or persistent digestive disorders have brought on a general enfeeblement and wasting. This view is very much in conflict with my own experience; the worst forms of tachycardia I have met with have been in neurasthenics who looked healthy and robust and who presented but little digestive derangement. Further, as a severe or harassing symptom it is met with very seldom in neurasthenics who presented profound cerebral depression, alimentary disturbance and wasting. On the contrary, disturbance of the cardiac rate in an opposite direction, an habitual bradycardia as low as fifty beats per minute, which may be encountered in neurasthenics, I have often met with in those who showed bodily enfeeblement and emaciation. Between the paroxysms of tachycardia the heart's action is regular in force and rate.

(*b*) *The Vascular and Vaso-Motor System.*—(1) The arterial tension in neurasthenia is almost invariably lowered. (2) Pseudo angina pectoris (cardialgia) is very common, and usually a conspicuous symptom in cardiac neurasthenia. It almost invariably takes the form of a sudden, sharp, stabbing pain, sometimes associated with a sense of constriction, in the cardiac region. It is of momentary duration, and occurs only occasionally—two or three times per day, or once in so many days or weeks. When it comes on, the patient is thrown into a sudden paroxysm of anguish and terror, and syncopal manifestations sometimes follow as a consequence. The angina helps, in those that experience it, still further to weaken the self-confidence, and to foster the fear that sudden death from cardiac failure is sooner or later doomed to occur. (3) Epigastric and hypogastric pulsation is often visibly present on inspection, or readily elicited on gentle palpation. (4) A sensation of throbbing in the head or pulsation in the legs is very commonly complained of, the patients experiencing it being able to count the pulse rate accurately by the vascular pulsation they hear in the head or feel in the legs. (5) A feeling that the brain is loose and moves ("jolts") inside the cranium, is a complaint frequently encountered in neurasthenia, and so is a sensation of fullness or increased tension, as if there were too much or an overflow of blood in the brain, associated with a feeling of bursting—that the blood in the brain is attempting to escape—at the root of the nose. (6) Vertigo or "a swimming in the head" is of occasional occurrence in some neurasthenics; it is usually of momentary duration, and seldom so severe as to make the patient actually lose balance. In this connection may be mentioned the peculiar sensation experienced by some neurasthenics whilst lying in bed, of sinking through space. (7) Symptoms indicative of disturbance in the peripheral circulation are constantly present; the commonest of these are: (i) habitual coldness of the hands and feet the result of vaso-constriction; (ii) the *tâches cérébrales*; (iii) formication—a sensation of insects crawling on the skin; (iv) frequent blushing and flushing of the face, and the occasional occurrence of blotches of redness on the chest and back, accompanied often by a most irritating pins-and-needles sensation and a feeling of warmth; these are vaso-dilatator phenomena, and not urticarial in nature, and may occur whilst the patient is at rest, but much more commonly when he is up and about.

D.—Disorders of Sleep.

This usually takes the form of a decided inability to fall asleep until several restless hours have been spent in bed, and, again, of a tendency to awaken at an early hour of the morning, when somnolence vanishes, so that sleep has been insufficient and unrefreshing. Some patients, however, experience but slight difficulty in falling asleep, but exhibit a ready liability to awaken after a short interval, the night being passed in alternating periods of restless wakefulness and sleep. But even when the patient gets a sufficiency of sleep, it is never very refreshing, and, moreover, is apt to be disturbed by disagreeable or distressing dreams. Further, there may be the phenomenon of momentary trance already described, with or without actual insomnia.

E.—Alimentary Disturbance.

The great majority of cases present alimentary disturbance of some kind, constipation, flatulence, gastric or intestinal, and dyspepsia being the commonest. Some patients have flatulence without knowing or complaining about it. The appetite may be impaired, but often is quite good.

F.—Disturbances of the Special Senses.

(*a*) *Vision.*—Patients often complain that they cannot read for any length of time, owing to the extreme readiness with which fatigue of the eye (neurasthenic asthenopia) occurs, or headache is produced. This easily induced fatigue of the eye is possibly the result of exhaustion of the muscles of accommodation, the retina, or the cortical centres. Further, some patients present the anomaly of specks floating before the eyes; others complain of an intolerance to strong light, possibly due to retinal hyperæsthesia.

(*b*) *Hearing.*—Auditory hyperæsthesia may occur, and is manifested by an extreme sensitiveness not only to noises, but to musical and pleasant sounds as well, and also by hearing arterial pulsation in the head (already referred to). Tinnitus aurium sometimes occurs.

G.—Exaggerated Tendon Reaction.

The reflexes (tendinous and superficial), especially the knee jerks, are exaggerated in practically all cases. Increased excitability of the muscles to percussion is also observable, blows upon nerve trunks or motor points producing immediate responsive contractions of the muscles which they govern.

H.—Disorders of Common Sensation.

Hyperæsthesia is the commonest sensory disturbance, and is manifested chiefly by sensitiveness to pressure, extreme suspectibility to atmospheric changes (heat, cold), as well as by hyper-sensitiveness to pain. There may be special hyperæsthetic zones in various parts of the body (*e.g.*, sensitive scalp, facial tenderness). Paræsthesia—a subjective sense of numbness or tingling—may occur (*e.g.*, in the limbs), but actual anæsthesia never. Besides these disorders of superficial sensibility, disturbance of deep sensibility is frequently encountered, that is, sensations related to internal organs; some of these are painful and distinct, others are vague and almost indescribable.

I.—Other Symptoms.

There may be visceroptosis, usually in elderly people who have emaciated; sexual disturbances, such that coition is very exhausting, weakly performed, and accompanied by great cardiac excitability; a subnormal temperature, which is almost always 96° F. or 97° F.; an inability to take a deep breath ("to get at the bottom of it"), and sometimes a sense of suffocation, the breathing is shallow, but dyspnœa never occurs; and dysphagia. Lastly, the hair in neurasthenia, even during the prodromal period, is apt to be dry, and has a tendency to become prematurely grey. The skin, too, except during moments of excitement, when it is clammy and moist, is usually dry, and patients often complain that they cannot perspire as they used to do. Further, as regards the personal appearance, some patients, especially young adults, present little or no alteration, whilst older patients look haggard, worried, and aged. Similarly, the state of nutrition of the body varies within the limits of absolute normality (*i.e.*, the maintenance of the usual state of body health) and extreme emaciation.

Owing to the conflicting views of authorities on the subject, a word or two is necessary in regard to the hæmatological and urinary findings in neurasthenia. As a result of histological examination of the blood of many neurasthenic patients, I was unable to detect any deviation from the normal, and I am thus of the decided opinion that the R.B.C W.B.C. and differential leucocytic counts as well as the Hb. percentage, do not exhibit any physiological aberrancy in neurasthenia, except in a few cases, in which anæmia exists in association, so that no pathognomonic value can be assigned to the hæmatological abnormality.

Concerning the urine in neurasthenia, phosphaturia is intermittently present in about 50 per cent. of cases, but I am convinced that this is often directly attributable to the ingestion of an abundance or preponderance of articles of food containing phosphorus. Further, employing Stokvis's modification of Jaffe's test, I have only twice found in pure and uncomplicated neurasthenia more than the normal small trace of indican in the urine. In some of my neurasthenics, the amount of indican in the urine was, indeed, even below the average physiological trace, a fact possibly dependent upon the exhibition of a milk instead of the ordinary mixed diet.

The foregoing constitute the clinical phenomena I have met with in my cases of neurasthenia. Naturally, here, as elsewhere, patients have not the same uniform, unvaried tale to tell, but few pass through an actual attack without experiencing most of the symptoms detailed, which collectively constitute the symptom-complex embraced in my conception of neurasthenia *vera et pura*. One particular symptom may predominate and overshadow the others, but with very patient and painstaking inquiry, it is often surprising how much of the symptomatology just described can be elicited in any particular case. Although the syndrome of neurasthenia is built up mainly of subjective symptoms, objective signs are seldom wanting, those most constantly occurring being palpitation, tachycardia, and dermatographia. But the possession of a clear understanding of the meaning of the subjective symptoms will, despite their multiplicity, remove any source of difficulty or confusion in arriving at a definite diagnosis.

THE VARIETIES OF NEURASTHENIA.

Much disagreement exists among authors about the number of varieties into which the disease should be divided. Many classify the disease into a great number, some of which are based upon the supposed predominance of certain alleged ætiological factors, such as "genital neurasthenia," "sexual neurasthenia," "hereditary neurasthenia." Others group according to the predominance of symptoms referable to certain organs, thus "gastric neurasthenia," "cardiac neurasthenia," "visceral neurasthenia," etc. Others, again, differentiate by the preponderance of symptoms expressive of distinct functional impairment in one or other part of the nervous system (*e.g.*, "cerebral neurasthenia," "spinal neurasthenia," "cerebro-spinal neurasthenia," "angiopathic neurasthenia,"), and yet others, such as "neurasthenia of women," "neurasthenia gravis," in cases presenting profound weakness, "neurasthenia terminalis" (when tissue changes have followed upon derangement of function), and so on.

On the subject of dividing neurasthenia into varieties, Savill remarks: "It does not seem to me scientific, for it is undoubtedly a general disorder and all of its symptoms are manifested through the nervous apparatus which permeates the whole body."[7] But a classification into varieties is permissible and advisable, if based upon differences in the clinical picture of the disease, and as clinically, we undoubtedly can distinguish, cases presenting special distinctness of their own, I do not share Savill's view. But we ought certainly to object to recognize as scientific classification such varieties, *inter alia*, as sexual neurasthenia, visceral neurasthenia, etc., as distinctive forms based on the alleged causation of the disease by excessive sexual indulgence or masturbation on the one hand, or associated alimentary disturbance on the other, because they do not imply special characteristics whereby the neurasthenia itself can be identified. In my view, a convenient classification would be to divide neurasthenia into two varieties: (1) cerebro-spinal neurasthenia (with its subdivisions, cerebral neurasthenia—cerebrasthenia, and spinal neurasthenia—myelasthenia), and (2) cardiac neurasthenia. Cerebro-spinal neurasthenia is the ordinary form of the disease; as a rule, the cerebral symptoms predominate, sometimes the spinal, but they always occur in combination.

Furthermore, all cases of neurasthenia are intrinsically cases of asthenia of the cerebral and spinal system of nerves. With regard to cardiac neurasthenia, most authorities do not recognize or emphasize this as a distinct clinical entity or at least do not see the necessity for doing so. But from the point of view, both of diagnosis and treatment, my experience of cases that come under this category convinces me strongly of the need for emphasizing this variety. Moreover, it undoubtedly possesses clinical distinctiveness of its own. The cardiac neurasthenic, after passing through the usual prodromal period, develops the circulatory disturbances detailed under the symptomatology of the disease—palpitation, tachycardia, pseudo-angina, etc., especially the first two. These in turn intensify the slowly oncoming and previously existing cerebrasthenia and myelasthenia. A vicious circle of events is thus set up, of which the cardiac symptoms were, in great measure, the starting point, which, in the course of time, results in a widening of the clinical picture, so as to embrace the symptomatology of the disease already detailed, more or less. The justification for recognizing cardiac neurasthenia, then, lies in the fact that the cardiac disturbances are the initial and leading symptoms, and from the patient's point of view, the most alarming and most distressing.

I am not in these pages concerned with the discussion of what has been designated traumatic neurasthenia. My experience of this class of case has been limited, but, judging from the cases I have encountered, as well as from descriptions of cases by writers on the subject, I am of opinion that so-called traumatic neurasthenia is not a distinctive clinical entity. What is called "traumatic neurasthenia" often does not conform to the syndrome of neurasthenia pura at all, and when it does, the existence of a long-standing pre-neurasthenic state, and a highly neurotic or neuropathic proclivity is usually traceable in the patient's antecedents. Hence the term neurasthenia of traumatic origin would be more appropriate for this class of case.

PATHOGENESIS.

Numerous theories have been propounded to explain the pathogenesis of neurasthenia. Of these, the theory of gastric dilatation and auto-intoxication, of which the chief exponent is M. Bouchard, is, perhaps, that most generally entertained. I quote Gilbert Ballet's summary of Bouchard's teaching: "Under the influences of various causes, and in virtue of hereditary or congenital weakness of the muscular walls of the stomach, this organ contracts insufficiently in the intervals between different periods of digestion. The digestive fluids (saliva, mucus, and gastric juice), mingled with remnants of food, tend to remain in it, to ferment, and to putrefy, all the more so that the gastric juice no longer contains hydrochloric acid in sufficient proportion to resist the action of the ferments. These abnormal fermentations continually produce soluble toxins, which when re-absorbed go to impair in varying degrees the anatomical elements of the different organs and notably the nerve centres."[8] Savill, in this country, strongly advocated that, in the great majority of cases, neurasthenia was dependent upon gastro-intestinal derangement and resulting auto-intoxication. What are the arguments that have been urged in support of this gastric and auto-intoxication theory? Firstly, that many neurasthenics present gastro-intestinal derangement of some sort, which is antecedent to the neurasthenia in point of time, and that the cure or relief of this cures or relieves the neurasthenia as well; secondly, that in some cases there exists a possible source of auto-intoxication, such as decayed teeth, pyorrhœa alveolaris, or chronic appendicitis. But in the light of the criticism that follows, this pathogenetic doctrine must, in the absence of more convincing evidence, remain untenable.

Firstly, very often we meet with cases of prolonged gastric disturbance (dilatation, stasis, dyspepsia, etc.) in whom the neurasthenic syndrome is altogether non-existent, and further, oral sepsis, long-standing and obstinate constipation, and chronic appendicitis are very often unaccompanied by neurasthenia. In this connection, I well remember in my student days coming across a female patient, aged 50, suffering from bowel carcinoma, in the Royal Infirmary of Glasgow, who practically all her life got an evacuation of the bowels only once in sixteen or eighteen days; yet she never exhibited nervous symptoms, nor, indeed, suffered discomfort of any kind.

Secondly, "exploration by means of the stomach tube has enabled the absence of any gastric stasis to be directly verified in a crowd of cases. . . . On the other hand, the absence or deficiency of hydrochloric acid, which constitutes one of the essential elements of this pathogenic doctrine is frequently wanting in dyspeptic conditions . . and it is not rare to encounter excessive secretion of hydrochloric acid."[9]

Thirdly, in many cases, the normal state of nutrition is maintained, the complexion is good, pyorrhœa alveolaris or other source of possible toxæmia has never been present, and, in some cases, the gastro-intestinal function is little, if at all, disturbed.

Fourthly, I hold that an actual attack of neurasthenia is always ushered in by an exciting cause, intrinsically mental in origin.

Fifthly, the cure or relief of the neurasthenia by successful treatment, directed towards an associated alimentary disturbance, is not proof that the one is necessarily the effect and the other the cause, and it certainly does not afford any evidence of the occurrence of an auto-intoxication or toxæmia, which tends to deteriorate nerve-tissue or nerve-function.

Sixthly, I have observed, in some cases, improvement in, or recovery from, the neurasthenia without any improvement in the associated alimentary derangement.

Seventhly, I have made repeated blood examinations in my cases, and have failed to detect, except in a few in which anæmia existed in association, any aberrations from the normal state, which one might expect to, and does, find in chronic, general intoxications, such as pernicious anæmia, metallic poisoning, etc.

A failure to recognize what I have designated the pre-neurasthenic state might well account for the contention, which I believe to be erroneous, of Savill and others, that in most cases the gastro-intestinal disturbance is antecedent in point of time to the neurasthenia. I have met with patients who presented alimentary derangement, in whom the fact could be elicited, but only after the most painstaking inquiry, that the alimentary derangement simply brought into greater prominence a slowly oncoming, previously existing, neurasthenic state. One has, naturally, to depend in great measure upon the patient's own testimony, and many, fearing that their symptoms may be stigmatized as imaginary, to avoid this, willingly, or at least rashly and wrongly, connect their nervous symptoms with stomach or intestinal disturbance from which they may have suffered for some considerable time, but which, in fact, has not preceded the nervous symptoms. Furthermore, we must avoid confusing nervous manifestations—a neurasthenoid state, which may be encountered in many diseases that constitute a drain upon the system—with true neurasthenia. But the contention that auto-intoxication, the absorption from the intestinal tract of poisonous products, chemical or bacterial, which act deleteriously on nerve tissue or nerve function, occurs in neurasthenia, has not yet advanced beyond the stage of an hypothesis; it is unsupported by experimental or other conclusive evidence. If intestinal auto-intoxication is the sole and primordial determining factor in the causation of neurasthenia, we have still to be told why patients with long-standing histories of gastric and intestinal disease do not manifest the neurasthenic syndrome or sometimes nervous symptoms of any description. Then, again, is it not universally held that the liver acts as a barrier against the ingress into the general circulation of poisonous substances from the intestinal tract, receiving as it does all the blood, with its contained products of digestion from the digestive organs? In support of this protective function of the liver, has it not been shown (1) that trituration of liver substance with certain alkaloids diminishes their toxic properties, (2) that curare is harmless when taken by the mouth, but powerfully toxic when administered hypodermically, and that this is due to its being carried to the liver and excreted in the bile? It would, therefore, appear highly probable that the prejudicial effects on the system of the products of protein disintegration (ptomains), or of bacterial activity (toxins), are in great measure thwarted by the depurative and protective function of the liver, which excretes or destroys the virulence of these toxic materials.

Savill maintains that chronic suppurative conditions are capable of producing neurasthenia. But is the latter ever the direct result of the suppurative process? If it were, we should, for example, have frequent opportunities to observe it in wounded soldiers, who present, for weeks and months, chronic suppurative lesions, and in whom signs of general absorption are manifest. But during fifteen months' experience with wounded soldiers, during which time hundreds of such cases have come under my observation, I have not met with a single case exhibiting neurasthenia, or even distinct nervous symptoms of any kind, as a consequence of the suppuration. The argument may, perhaps, be allowed, from the contention of the toxæmists or auto-intoxicationists, that acute toxæmias should be capable of effecting in a short time what it is alleged chronic toxæmias takes months or years to produce. But in acute general toxæmias there are either no nerve symptoms at all, or the nervous manifestations, resulting from a sufficiently virulent circulating toxin, take the form of delirium, convulsions, coma, or insanity, as in uræmia, pneumonia, typhoid fever, etc. The neuro-muscular prostration resulting from infection with Pfeiffer's bacillus, though somewhat resembling in character the nervous asthenia encountered in neurasthenia, is entirely unaccompanied by the neurasthenic syndrome, and this, coupled with the extraordinary rapidity of recovery from it, suggests to my mind that the underlying causes of the two asthenias are not the same or kindred.

According to Herter,[10] neurasthenic symptoms may result from the continued administration of sufficient indol to give a constant and decided reaction for indican in the urine; but the presence of pathological amounts of indican in the urine is by no means a constant feature in neurasthenia,* and may be unaccompanied by it, for example, in catarrhal enteritis, suppurative conditions without free drainage, etc.

That gastric or intestinal anti-fermentative measures were in some cases, as Savill affirms, the most successful means of curing or ameliorating the neurasthenia, is possible. But we must take into account, firstly, the psychotherapeutic influence of the physician, and the psychic measures which Savill himself confessed to have employed in his routine treatment of all cases of neurasthenia; secondly, the occasional occurrence of temporary or permanent improvement, irrespective of any treatment; and, thirdly, the fact that the cure or amelioration effected, might easily have been the result of the patient's own unconscious auto-suggestion, inasmuch as the rectification of a long-standing alimentary derangement might remove an object of introspection and source of morbid impressions, and in that way raise the self-confidence, and set agoing a *circulus virtuosus* of psychic events that would bring about improvement. To summarize, therefore, the constant occurrence of gastric dilatation and intestinal auto-intoxication in neurasthenia must be regarded, at best, as an hypothesis, which, however, does not rest upon established evidence, clinical or otherwise, and in those cases in which it is encountered, it would appear to have the value of an associated condition, and not of an ætiological factor.

The theory, that neurasthenia results from defective assimilation of food due to dyspeptic states, has been put forward by Hayem. According to this observer, dyspeptic states, whether accompanied or not by gastric dilatation, cause incomplete assimilation of food, in consequence of which anæmia eventually supervenes with disturbance of the nutrition of the tissues generally, and the nerve elements in particular. Thus, the supporters of this theory postulate the occurrence of an actual deterioration of nerve tissue from the absorption of the products of a faulty digestion rather than from an auto-intoxication by toxins, elaborated during gastric fermentation.

---

* According to my experience, it is not a pathognomonic feature.

This theory, like that of Bouchard, is but an hypothesis, and, to my mind, a very inefficient interpretation. For how are we to explain those cases, so commonly encountered, of typical neurasthenia, in which the digestive apparatus has never been disturbed, the general nutrition has suffered no perceptible impairment, or, judging from the physiognomy and state of nutrition, the appearances deceptively indicate good health? Further, what of the innumerable martyrs to gastric and bowel diseases that present anæmia and other palpable signs of faulty assimilation and defective nutrition, but who have no neurasthenia? "And then, cases are frequent in which a traumatic shock has provoked the rapid and simultaneous appearance of the digestive disorders and the neurasthenic symptoms."

In this connection, I have repeatedly observed that neurasthenia is usually unaccompanied by impairment in the general nutrition in young adults, and that it is chiefly in patients past middle life, in whom the katabolic processes are in the ascendancy, especially if there is an associated gastric or intestinal derangement, that neurasthenia is accompanied by emaciation. Further, I hold it is quite probable that during the currency of the pre-neurasthenic state a dyspepsia may develop, which, for a time, fills the whole scene in the patient's existence, which aggravates, but has not engendered, the onset of the neurosis, in virtue of the depressing influence it very plausibly exerts "on the moral state of the patient, and by its being rebellious to the most diverse modes of treatment, constitutes a distressing and irritating source of incessant discomforts and disquietude."

The theory, put forward by Glenard, that neurasthenia is due to visceroptosis, prolapse of one or other of the abdominal viscera, is now no longer entertained and was even eventually discarded by Glenard himself. It is incontestable that in the large majority of cases of neurasthenia there is no visceroptosis, and that the latter may occur without neurasthenic symptoms. My experience is that visceroptosis may be encountered in neurasthenics who are past middle life and have emaciated. In my view, therefore, when it does occur, it has the value of a symptom or of a sequela, and not of a cause of the neurasthenia.

Weber's[11] angiopathic or vaso-motor theory comes nearest the true explanation of the pathogenesis. Angel,[12] before Weber, adduced clinical facts to prove that the disease is primarily a disturbance of the vaso-motor apparatus. Weber corroborated the contentions of Angel, and proposed to designate neurasthenia a vaso-motor neurosis. This observer lays stress on the existence in all cases of symptoms indicative of vaso-motor instability, viz., habitual coldness of the hands and feet, frequent blushing and flushings of the face, fleeting and localized dermatographia, formication, etc. He also urges, and rightly so, that the disturbances of common sensation—the hyperæsthesias, the dysæsthesias, and the paræsthesias, are of vaso-motor origin. But the pathogenesis, obviously, remains insufficiently explained until we further enunciate the *causa causans* of this instability of the vaso-motor innervation.

Personally, I regard the disease to be the outcome of a long continued state of over-susceptibility of the brain, hyper-selfconsciousness or introspection, due to instability or increased excitability of the emotional centres, in other words, it is essentially a mental or psychical disorder. There is, as a rule, but not necessarily, a morbid nervous heredity, probably an inherited exaggerated irritability or responsiveness of the sensory centres in the brain. The psychical upheavals acting over a period of months or years (during the pre-neurasthenic state) are accompanied by phenomena indicative of sensitiveness or irritability of the vaso-motor apparatus in the brain[13] and elsewhere, which, during the prodromal period of the disease are mostly confined to the head (excessive blushing and paling of the face, headache, etc.). An actual attack of neurasthenia is precipitated by some cause or causes of more or less acute duration, and producing intense emotional excitement and increased introspection. For example, a pre-neurasthenic, whose emotional and vaso-motor mechanisms have been becoming increasingly unstable for years, is called upon one day at a dinner to give a toast, in proposing which he experiences intense mental and cardiac excitement. Later a pseudo-anginal pain may develop, and he begins to concentrate his attention on his heart, which becomes more and more irritable, until, eventually, an attack of cardiac neurasthenia develops, much of the symptom-complex of the disease supervening as a vicious circle of events.

Concerning the pathology of the disease, I conceive that the variations in the normal relationships of the affected nerve centres bring about, or are accompanied by, vascular disturbances, which probably produce a perverted metabolism in the nerve cells, and this, in turn, aggravates the aberrant functioning of the nerve centres. During the pre-neurasthenic state there probably exists a mild degree of cerebral anæmia. We know that the tone of the blood vessels is directly dependent upon the state of the nervous centres which control or can influence the circulatory system. In confirmed neurasthenia, the loss of vaso-motor tone is very apparent, and has become a fundamental pathological factor. It permits of the ready occurrence, as a result of the psychical upheavals, of cerebral hyperæmias followed by cerebral anæmias. The ready contraction and dilatation of the vessels of the face may be accepted as external evidence of such internal occurrences. But, generally, a chronic cerebral anæmia appears to be indicated in neurasthenia by the existence of diminished arterial tension, a tendency to cardiac acceleration, respiratory shallowness, etc. It seems to me to be highly probable that histological examination of the cells in certain parts of the brain of the neurasthenic, if that were possible, would reveal distinct morphological aberrancies from the normal state.

Having thus attempted to explain the pathogenesis of the disease as a whole, we may now evolve the pathogenesis of the leading individual symptoms, neurasthenic or pre-neurasthenic. Generally, we may regard the secondary symptoms as being due to loss of control of the higher centres over the lower ones, which results from disturbance in the equilibrium of the former, and their consequent impaired metabolism and easy fatigability.

The innumerable sensations of discomfort, referable to the heart and other organs, may well be attributed to such unrestrained activity of the lower centres, especially those of the sympathetic and vaso-motor systems.

The neuro-muscular asthenia is, likewise, very probably the result of the decided instability of the emotional centres, and the vaso-motor apparatus in the brain (?), cord, sympathetics, and vasa nervorum. The nerves have probably lost their normal cerebral inhibitory influence, owing to emotional unbalance, and have to bear the brunt of the incessant oscillations in the vasa nervorum, resulting from loss of normal vaso-motor control. Hence the normal nutrition of the nerves, and, in turn, of the muscles which they govern, is interfered with, as is also the efficient removal of the effete products of muscular activity.

The pre-neurasthenic and neurasthenic headache admits of a similar explanation. Auerbach[14] holds that the neurasthenic headache is referred to the interior of the skull, whereas Binswanger[15] regards it as being due mainly to tension of the scalp-muscles resulting from the accumulation in them during mental work of fatigue toxins. My patients have invariably referred the sense of pressure chiefly to the scalp-muscles, although they indicate that there is a dural (deep-seated) element as well. My observation, already mentioned, that temporary relief often results from placing the hand firmly on the head would perhaps seem to support the view that the pressure is mainly superficial. Most probably, therefore, the headache is due to defective nutrition of the nerve cells, pressure of the vasa nervorum on the nerve endings in the dura and scalp, and the ready production and accumulation of fatigue toxins in the scalp muscles, all of which occurrences may result from the incessant oscillations in the vasa nervorum. The ready tendency to blushing and flushing of the face, with its resulting variations in the quantity of blood flowing to the head, tends, I believe, to support this view.

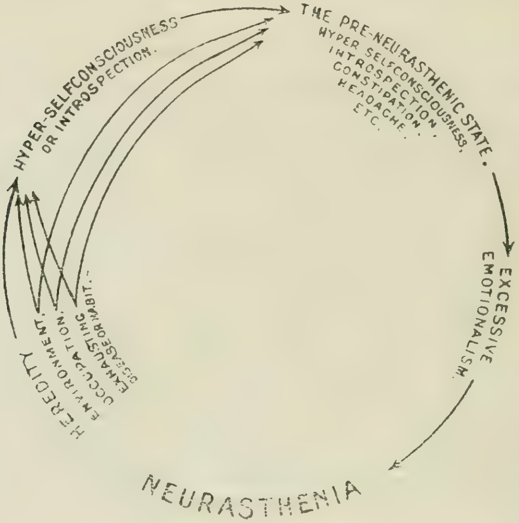
The development of phobias in neurasthenia admits, in my opinion, of a simple explanation. A patient, for example, who has had repeated attacks of tachycardia, begins to foster the fear that sudden death from cardiac failure is, sooner or later, bound to occur; hence he avoids going any distance from home, for he imagines himself safest there; he avoids company, which too often has served to engender an attack; he dreads a railway carriage, because travelling, company, and confinement excite him; he develops monophobia, because he would be deprived of assistance if anything happened to him whilst alone, and so on. In other words, I have almost invariably elicited that the phobias had a "rational" basis developing as a vicious circle of events.

The pathogenesis of tachycardia and palpitation is readily explainable as a manifestation of diminished control of the higher centres over the lower ones. Mœbius[16] has studied tachycardia in the human being, and the physiology of the subject is fully and clearly stated by Hutchison[17], from whom the following observations are quoted: "When the influence of the vagus nerve is removed, the rate and force of the heart-beat are both increased, but the former more notably than the latter. There are limits, however, to the increase of the rate observed as the results of vagus lesions in man. In no such case have the heart beats amounted to more than 160 per minute. Pulse-rates above this, therefore, cannot be due to vagus paralysis alone. . . . Gaskell has described the sympathetic nerve as a katabolic one, for it tends to increase those chemical changes which lead to the beat, and he compares it to a vaso-constrictor. . . . Physiological evidence points to the fact that an increase in the rate of the heart is always due to a diminution of vagus tone, and not to an increased action of the sympathetic. . . . It might seem natural to suppose that cases of palpitation characterized by increased force and frequency of the beats were produced by an increase of the sympathetic influence; but this would appear to be not the case. The mere fact that such attacks may cease very abruptly would negative such a view, for experimental stimulation of the sympathetic always shows that the heart continues to beat rapidly for a long time after the stimulation has ceased. Even emotional increase in the heart's rate, then, is apparently due to a temporary diminution of vagus tone. . . . At the same time, such temporary suppression of vagus control could not exert such an immediately marked influence upon the rate of the heart were it not for the constant action of the sympathetic, which merely waits, as it were, for the opportunity afforded by the relaxed control of the vagus in order to assert its influence." The tachycardia and palpitation of the neurasthenic are invariably excited by psychical or emotional upheavals, a fact which precludes the possibility of their toxic origin.

ÆTIOLOGY.

The ætiology of neurasthenia will readily be inferred from our conception of the pathogenesis just stated. There exists nearly always a neurotic or neuropathic constitution, inherent or acquired, rendering the nervous system vulnerable. I am convinced that a family bias towards nervous disease is absent in some cases. And why, after all, should not the disease be able to appear *de novo* in an individual without congenital predisposition, if it is due to repeated psychical excitations, acting over a long period of time? The exciting factor of an actual attack is always some cause or combination of causes intrinsically mental in origin, which produces marked instability of the emotional apparatus, such as excessive emotionalism, fear, and "shock" in traumatic neurasthenia.

The nervous phenomena observable as the direct result of excessive tobacco-smoking, chronic alcoholism, metallic poisoning, phthisis, diabetes, etc., constitute a neurasthenoid state, but never the picture of true neurasthenia. The latter may manifest itself in cases presenting long-standing histories of gastric or intestinal disorders, but the exact production of the disease is not, I hold, by way of an auto-intoxication or toxæmia, but in the manner previously indicated. Masturbation, excessive venery, chronic wasting disease, etc., alleged by some to be ætiological factors, never, in my opinion, act as exciting causes, though they may aggravate an existing neurasthenic or pre-neurasthenic state, or, perhaps, engender the latter. I may here state that I have had two patients in whom a severe attack of influenza supervened during the currency of a very virulent attack of neurasthenia, without producing the slightest aggravation in the nervous symptoms, either during the incidence of the influenza or during convalescence from it, a fact which does not support the view generally obtaining, that influenza can act as an exciting cause of neurasthenia. Indeed, I have not met with a single case in which it has done so, although, to be sure, the widespread prevalency of influenza nowadays will occasionally render its occurrence a coincidental fact in the life-history of the neurasthenic, some time before the precipitation of the neurasthenia.



GRAPHICAL REPRESENTATION OF MODE OF PRODUCTION OF NEURASTHENIA.

EXPLANATION.—*Heredity, aided by (in a few cases, replaced by) environment, occupation, exhausting disease and habit, predisposes to the development of the self-conscious and introspective nature. Thus comes into being the pre-neurasthenic state; it may not be until the beginning of this that environment, occupation, exhausting disease and habit play their ætiological parts. There comes a time when the patient passes through a period of intense emotionalism, and it is the acute and repeated psychical traumata which occur then that engender the neurasthenic syndrome.*

The pre-neurasthenic state seldom begins before puberty, and progresses *pari passu* with the maturation of the mental and emotional faculties. Actual neurasthenia usually occurs between twenty and sixty years of age. I agree with most observers that males suffer more than females, which is to be expected, owing to man's more active and more militant life, intellectually, morally, and physically. Occupation undoubtedly has a distinct ætiological value, in respect that cerebral over-pressure exerts a deleterious influence on the congenitally predisposed. But I attach a much higher value, as a causative factor, to the environment in which the patient moves, both publicly and privately, because, as previously indicated, it is the reaction of environment on the emotional and psychical apparatus, which is the important determining and predisposing factor. Race, too, may have an ætiological bearing, but this obviously is to be regarded only as a phase of hereditary influence. Such effect of racial characteristics is exemplified in the Jews, who, in virtue, undoubtedly, of the oppression and persecution they have had to withstand for centuries, and their consequent need to live by their "wits," are a highly strung, nervous race, exhibiting nervousness in a notable degree, and are especially prone to neurasthenia and other psychoses or neuroses.

The ætiology and mode of production of the disease, according to my conception of it, may be stated graphically, as in the representation.

CONCLUSIONS.

1. There is practically always in true neurasthenia a long prodromal period ("the pre-neurasthenic state") characterized by well-defined and significant morbid manifestations indicative of aberrant functioning of the emotional centres in the brain and of the vaso-motor mechanism.

2. The immediate cause of this emotional and vaso-motor instability is the reaction of environment (using the word in its widest acceptation) on the patient's mind or cerebration, which has usually been rendered more vulnerable in this direction by inherited proclivities, although heredity is not an absolutely essential contributory factor.

3. The pre-neurasthenic state is not actual neurasthenia and sometimes never develops into the wider and more pronounced syndrome constituting the latter.

4. Neurasthenia is the culminating development from the pre-neurasthenic state, and is excited usually by more excessive emo-

tionalism than is characteristic of the latter, acting over a period of days, weeks, or months. In a sense, therefore, neurasthenia is an acute development, an exacerbation of a long-standing disorder, although it is perhaps more appropriate to designate it a chronic functional disease of the nervous system, essentially brought on by psychical (emotional) disturbances acting over a long period of time.

5. Neurasthenia is a definite syndrome which is quite distinct from, and must not be confounded with, the nervous asthenia of many neurasthenoid states, which constitute the prodromal periods of various psychoses, or which result from the abuse of stimulants or drugs or tobacco, or which are symptomatic of other (organic) diseases (*e.g.*, phthisis, diabetes, influenza, anæmias, carcinoma, etc.).

6. The various theories (those of auto-intoxication and toxæmia, etc.) promulgated to explain the pathogenesis of the disease, belong to the realm of postulation, being unsupported by conclusive clinical or other evidence. The failure, hitherto, to recognize adequately the pre-neurasthenic state—the *fons et origo morbi*—and its pathogenetic rôle in the development of the subsequent morbid events accounts for the multiplicity of theories, and the hitherto vague and divergent conceptions of the pathogenesis.

7. Neurasthenia is most probably characterized pathologically by the existence generally of a chronic cerebral anæmia, whilst the emotional and vaso-motor instability which is constantly present in this disease permits of the ready occurrence of cerebral hyperæmias followed by cerebral anæmias. The nerve cells of the brain, therefore, are most probably the victims of a diminished or perverted metabolism, and probably histological examination of these cells (if that were possible) would reveal morphological aberrancies indicative of this.

8. The varying and multitudinous symptoms of neurasthenia are the expression of aberrant functioning of the emotional, centres, and of the vaso-motor, sympathetic, sensory, and motor system of nerves, and many of them (such as phobias, etc.) are to be regarded as what might be termed " vicious circle " manifestations.

9. But whilst some of the symptomatology is the product of an unconscious auto-suggestion, the disease is by no means an imaginary one, many of the symptoms, by whichever way arising, being either painful or intensely distressing and alarming. Hence neurasthenia is to be clearly differentiated from obsessions, hysteria, melancholia, and hypochondriasis.

10. The heart, in virtue of its abundant and intricate nerve supply, which is under such intimate and sensitive central influence, and the blood vessels, in virtue of their universal distribution and their abundant, complex, and sensitive vaso-motor control, are usually the first to reflect the central functional disturbance in neurasthenia.

11. The most scientific classification into varieties of this (or any other) disease, is that based upon differences in the clinical picture, and, having regard to this, only two varieties need be recognized, viz., (1) cerebro-spinal neurasthenia (with its subdivisions cerebrasthenia and myelasthenia), and (2) cardiac neurasthenia. A whole series of needless and useless nomenclature can thus be dispensed with.

REFERENCES.

[1] Eulenburg, A.: "Sexual Neurasthenia," in *Diseases of the Nervous System*, edited by Church (New York, 1908), p. 977.

[2] Savill, T. D.: *Lectures on Neurasthenia* (London, 1908), p. 25.

[3] Allbutt and Rolleston: *System of Medicine*, Vol. VIII., p. 745.

[4] Beard, G. M. B.: *A Practical Treatise on Nervous Exhaustion (Neurasthenia)*, 1890, p. 88.

[5] Dowse: *The Brain and the Nerves*, p. 102 (1892).

[6] Ballet, G.: *Neurasthenia* (trans. by Smith), 1911, p. 62.

[7] Savill: *Lectures on Neurasthenia*, p. 25.

[8] Ballet's *Neurasthenia* (trans. by Smith), p. 127.

[9] Ballet's *Neurasthenia* (trans. by Smith), p. 128.

[10] Herter: *Lectures on Chemical Pathology*, p. 212.

[11] Weber: "A Study of Arterial Tension in Neurasthenia" (*Boston Medical and Surgical Journal*, May 3, 1888).

[12] Angel in the *Archiv für Psych.*, VIII., 2.

[13] "There is some, but not very definite, evidence pointing to the existence of weak cerebral vaso-motor nerves."—(Leonard Hill, Vol. VIII., p. 19 Albutt; *System of Medicine*.)

[14] Auerbach, Dr. Siegmund: *Headache* (trans. by Playfair, 1913, p. 83).

[15] Binswanger: *Die Pathologie und Therapie der Neurasthenie*, Jena, 1896, p. 303.

[16] Moebius: *Clinical Observations on Tachycardia*, Stuttgart, 1895, p. 37.

[17] Hutchison, Robt.: *Applied Physiology*, London, 1908, pp. 123–125.

Practical Notes.

TREATMENT OF PYODERMATITIS.

Under this term, Carle, of Lyons, includes various infections of the skin, due to eczema, folliculitis following itch, dermatitis, impetigo, and so forth, in which the infective agent is usually streptococcal or staphylococcal, and which are very prevalent in the field. The treatment recommended is most suitable for use in dressing-stations at the front, and he has been able to limit the materials to the use of five elements: boiled water, oil of cade, zinc oxide, vaseline, and tincture of iodine. He begins by a careful and thorough cleansing of the skin with plenty of soap, followed by lotions or rubbing with spirit of some sort. All the crusts are removed, and inflamed follicles are touched with iodine. A good thickness of absorbent wool, thoroughly soaked in boiled water, is then applied to the affected region over a single layer of sterilized gauze, and kept in place with gutta-percha tissue and a bandage. The wool is wetted three times in the day without removing more than the tissue and bandage. The dressing is renewed on the following morning. Care must be taken that the dressing is not removed too brusquely, so as to avoid pulling away the epidermis from inflamed patches of skin. Scratching by the patient must be prevented by watching.

As soon as the purulent and inflammatory patches have cleared up, healthy and quick granulation is promoted by using pastes or ointments. A paste always gives better results than an ointment, and a large proportion of zinc oxide to the fatty vehicle should be used. The active agent employed is oil of cade, and Carle makes use of it in the following way:—

Oil of cade	20 g.
Oxide of zinc	30 g.
Vaseline	100 g.

To make an ointment.

Oil of cade	20 g.
Oxide of zinc	100 g.
Vaseline	100 g.

To make a paste.

The ointment is used when the epidermis is healing steadily, and the paste in cases in which oozing has not yet stopped. The smell of the oil of cade can be masked by using 10 per cent. of camphorated oil. The paste should be renewed morning and evening. The layer adhering to the skin, however, should only be removed once a day by soapy or oily applications, used with care and gentleness. In the course of treatment, the paste should only be applied to the places actually healing; the rest of the area should be well powdered with talc. The paste should be spread on a piece of linen, which is much better for the purpose than gauze; in the case of ointment, any material will serve. Deeper lesions, such as suppurating follicles or ecthyma, should be cauterized with tincture of iodine; in the case of follicles, these are emptied by pressure and carefully cleaned beforehand. For ecthyma, touching with nitrate of silver is sometimes necessary, and the use of a plaster of some kind.—(*Journ. de Méd. et de Chir. prat.*, November 10, 1917.)

PREVENTION OF MOSQUITO-BITES.

Bonnin recommends the use of a spirituous solution of quinine as a topical protection against the bite of mosquitoes :—

Neutral sulphate of quinine	1 g.
Alcohol (95°)	32 g.
Water	11 g.

To make a lotion.

This is applied over all exposed parts and dries on very quickly. This has been tried in places infested by mosquitoes, and the best proof of its effectiveness is to be found in the fact that officers and men never fail to come for a fresh supply. In the case of one officer, in whom mosquito-bites were always followed by great swelling of the skin, he was able to carry on his work in a forward observation post, which was surrounded with shell holes swarming with mosquitoes.—(*Journ. de Méd. et de Chir. prat.*, November, 10, 1917.)

CULTURE-MEDIUM FOR QUICKLY IDENTIFYING THE B. DIPHTHERIÆ.

Costa, Troisier and Dauvergne have elaborated a medium for this purpose based upon the fact that the diphtheria bacillus acts upon glucose whilst the diphtheroid varieties do not. It is coagulated in Pétri dishes at 75°–80° C., and is composed of—

Horse serum	100 cc.
Solution of glucose ($30^{\circ}/_{0}$) sterilized	10 cc.
Concentrated tincture of litmus sterilized	30 drops.
Sulphuric acid in $1^{\circ}/_{0}$ solution	3 cc.

After 24 hours' incubation, the colonies of B. diphtheriæ, the size of a pin's head, appear red in the middle and rose at the periphery by transmitted light over grey on a red base by reflected light. Colonies of diphtheroids remain blue.—(*G. R. Soc. de Biologie*, July 28, 1917.)

Reviews of Books.

The Practitioner's Pocket Pharmacology and Formulary. By L. FREYBERGER, J.P., M.D., M.R.C.P. and M.R.C.S. Pp. viii + 545. London: William Heinemann. 12s. 6d. net.

IT might be thought that there must be so many compendiums dealing with drugs and their uses, that there could not possibly be room for another one; but Dr. Freyberger has not been daunted by the many predecessors who have trodden the same path. His aim has been to give in the smallest possible compass a complete description of the action "of all the drugs and preparations of the pharmacopœias of Great Britain and Ireland and of the United States of America," as well as of other drugs and preparations, including many of those newer productions of chemical research. The matter is arranged alphabetically according to the Latin names of the drugs. These paragraphs are found under each drug: Properties, which include also origin, composition and, sometimes, method of production; corrigents, which also implies form and methods of administration; use; indications; counter-indications; dose; maximum dose; overdose; treatment; antagonists; and incompatibles. In each of the paragraphs the information is conveyed without the use of an unnecessary word. In the monographs treating of the newer remedies are formulæ given in detail for the treatment of specific ailments. At the end of the book there is an index of "Indications and Counter-indications" covering about eighty pages. Dr. Freyberger seems to have justified his temerity. The book is most handy for the pocket and for the consulting room table; it is convenient for reference; the information it contains is reliable and presented so as to catch the eye easily; it is well printed on good paper, and quite attractively bound. There are a few little errors which will no doubt be corrected in a second edition, and among these should be noted the foreign spelling of some words such as Trijodphenylicum and Brenzcatechin, for which latter this is a good English equivalent in Pyrocatechin.

Public Health Nursing. By Miss MARY SEWALL GARDNER. Pp. 372. London: Macmillan & Co. 7s. 6d. net.

THE Science of nursing (for it is a science now) has developed from the germ of the spirit of service, slowly, but none the less surely. The ancestors of the modern nurse are the noble abbesses and other early Christian women, and not, as some suppose, the "Sairey Gamps" and Mrs. Harrises. It may be mentioned, in passing, that the noble abbots and monks, too, did their share in this good work in days gone by.

Miss Mary Sewall Gardner, in her book on Public Health Nursing, deals in her title with specialized nursing—nursing in regard to public health—but the branches of the Public Health Service are now so many and so far reaching, that the ground covered is, in fact, nursing in its wide sense. For instance, there are special nurses now for tuberculosis, child-welfare, schools, mental cases, and mental deficiency children, industrial diseases (including those peculiar to munition workers), medical social service, etc., all dealt with by Miss Gardner from the American point of view.

The book begins with a history of the Public Health Nursing Movement, giving us a short peep into bygone ages, with the abbesses and nuns, sisters of mercy, deaconesses, etc., flitting about noiselessly on their errands of mercy and succour (amongst whom, also, are to be noted abbots and monks), and gradually taking us, through more modern times, to Florence Nightingale and Pastor Fliedner and his two wives Friederke and Caroline, of Kaiserswert, where, as a fact, Miss Nightingale studied her nursing methods. These pioneers are of no country, but of the world, and naturally the United States come in for a fair share of praise, as well as, to a lesser degree, other countries (European and Eastern).

The fundamental principles of public health nursing are then dealt with: the employment of only well-trained nurses, undenominational at all times, with limited hours of work, so as to obtain the best results; the observance of the rules of professional etiquette; and strict co-operation with other agencies—a most important principle. The chapters on the modern problems to be faced and the public health nursing from the nurses' point of view (chapters 4 and 5) are noteworthy in connection with Part 1 of the book.

Part 2 deals with visiting nursing, the organization of a visiting nurse association, the appointment of a board of managers, the superintendent of nurses, the supervising or head nurse, the staff nurse, and the pupil nurse—all very important subjects, which are dealt with evidently by a woman who knows all the details.

Part 3 is the *raison d'être* of the book—treating of special branches of public health nursing, *e.g.*, tuberculosis, child-welfare, schools, etc., and many useful hints are given and many trains of thought started. Medical officers of health also would be well advised to study these chapters carefully. Strange to say, no chapter is devoted to munition factories, munition diseases, and munition crèches: the next edition should certainly correct this omission—and probably will, now that America has joined in the war. There is a good index.

Kala-Azar: its Treatment. By UPENDRANATH BRAHMACHARI, M.D., Pp. xii + 123. Calcutta and London: Butterworth & Co. 8s. 6d. net.

THIS book gives an excellent summary of the various methods that have been applied in the treatment of kala-azar or tropical splenomegaly, a disease which formerly claimed a mortality of over 90 per cent. By the use of antimony preparations, however, the majority of cases, if not progressed too far, can apparently be cured. The palm is given to metallic antimony in colloidal form—doses of 0·0004 grain leading to absolute cure—after which comes antimonious oxide. In two cases, intravenous injection of formaldehyde seemed to be specific, and it is a matter for surprise that this drug has not had an extensive trial.

The book is illustrated with a number of plates and temperature charts, and we commend it to the notice of all those who may have to deal with cases of kala-azar. It would have been a useful addition, if the references to the numerous authors referred to had been given.

A Manual of Practical X-Ray Work. By DAVID ARTHUR, M.D., D.P.H., and JOHN MUIR, B.Sc., M.B., Capt. R.A.M.C.(T.). Pp. 351. London: William Heinemann.

THE second edition of this well-known manual will be found an excellent text-book for beginners, and is especially well suited for those who find themselves obliged to undertake—with little or no previous knowledge—radiographic work in a military hospital. The description of apparatus is full and clear, though there is no mention of the new "rectipulse" apparatus, which entirely abolishes inverse current with coil outfits by applying to them the principle of the commutator used with transformers. The section on localization describes the best of the methods now in use, and refers to the modification introduced by Hampson, Thurston Holland, Shenton, and Barclay. Page 187 is devoted to a description of Hernaman-Johnson's method, and an illustration is given of his ring-localizer, but no mention is made of this author's name.

Photographic technique is concisely dealt with, and many useful "tips" are given. The authors are very severe on attempts at intensifying or reducing X-ray negatives. No method of reduction is described, but the reviewer has seen useful information exhaled from a plate which was too dense to "read" when it first came out of the developer. For various reasons it is not always possible to repeat the exposure, and every radiographer should know how to reduce. When working under strange conditions, liberal exposure, tempered, if necessary, by subsequent reduction, may save the situation. Intensification, on the other hand, is practically without value in radiographic work, and the authors are right to warn beginners that *correct exposure* is the only sound ideal.

The chapter on X-ray therapeutics, of about 30 pages only, would have been better omitted. Ringworm is dealt with fully, but, for the rest, the descriptions are scanty and the statements made often misleading. Under the heading of the *Nervous System*, for example, it is said that "no practical results have been achieved," whereas the truth is that, in disseminated sclerosis, syringomyelia, and locomotor ataxia, men can often be kept at their work or business for months or even years after they would otherwise have become helpless invalids. Radiotherapy is too big a subject to be treated casually at the end of a small manual devoted to the diagnostic side of X-ray work.

A Class-book of Organic Chemistry. By J. B. COHEN, Ph.D., B.Sc., F.R.S. Pp. viii + 344. London: Macmillan & Co. 4s. 6d.

ADVANCED students of organic chemistry are already indebted to Professor Cohen for a text-book which has become indispensable to them. We should imagine that this new work will shortly become as highly valued by the students for whom it is intended as the larger book. The author says that the "little volume has been written as an introduction to organic chemistry for the use of first-year medical students and for senior science students in schools." It deals with both the theoretical and practical sides of the subject. As each subject is discussed, appropriate quantitative experiments are presented for laboratory practice. This method of dealing with elementary science students has been generally endorsed by teachers as being eminently satisfactory.

The book is divided into three sections. The first comprises the purification of organic substances, and the preparation, reactions, and structure of ethyl and methyl alcohols and their derivatives, with the purpose of illustrating the general principles of organic chemistry; the second and third parts treat of the aliphatic compounds and aromatic series in a more systematic manner. A number of questions are given at the end of every chapter, and at the end of the book is a set of excellent quantitative problems. There is a most complete index.

Any student who does justice to this book will acquire, in our opinion, a sound knowledge of the main principles of organic chemistry, and the medical student will become excellently equipped with first-hand knowledge concerning the preparation of most of the important chemicals used in medicine and surgery. There is one little correction we think should be made: formalin does not contain any methyl alcohol, and certainly not 15 per cent.

The volume is printed and illustrated in that admirable manner so characteristic of this firm of publishers.

◆

Preparations, Inventions, etc.

THE "LATAPIE" SERO-REACTION FOR SYPHILIS.

(London: The Anglo-French Drug Co., Ltd., Gamage Building,
Holborn, E.C.1.)

A simplified method for obtaining the serum reaction in syphilis has been worked out at the Pasteur Institute in Paris. The antigen used is a concentrated alcoholic extract of congenital syphilitic liver, which is diluted for use from 22 to 26 times, the actual number being indicated on each tube supplied. An unopened ampoule, kept at room temperature and protected from light, remains good and active for years. The amount supplied in each ampoule is sufficient for a large number of reactions. Latapie's rapid method only requires the use of three small test-tubes, instead of the larger number employed in the original technique. Comparative tests were made between these two methods in fifty cases of undoubted syphilis, with the result that thirty-nine positive results were obtained by the original method, and forty-seven by the rapid method.

"BIPP."

(London: Messrs. Oppenheimer, Son & Co., Ltd., 179, Queen
Victoria Street, E.C.4.)

This preparation is composed of bismuth, iodoform, and paraffin, blended to form a paste. It is intended for the disinfection of septic wounds, and presents a method of great simplicity for securing this desirable end. Very few dressings are required. The wound to be treated is first opened up freely, under an anæsthetic and after the surrounding skin has been cleansed thoroughly with carbolic lotion 1 in 20. All foreign bodies are removed, and the wound is well mopped out with swabs soaked in methylated spirit. The wound is then filled up with the paste, dressed with sterile gauze and covered with an absorbent pad. This dressing need not be changed for several days, if the patient has no pain and no symptoms of constitutional disturbance. If discharge comes through at any point, this is soaked in spirit and covered with gauze wrung out in spirit. Redressing is easily done. The old dressings are removed and the wound is covered with a swab soaked in spirit. All discharge is cleansed from around the wound with spirit swabs. The paste in the depths of the wounds is left untouched; fresh paste is applied over the wound and the surrounding area and covered as before. Good results are reported from its use in compound fractures of the long bones, and abscesses filled up with the paste, after being opened and cleaned out, heal without further formation of pus.

"Bipp" is supplied in tubes containing 2 oz., and in jars of 1 lb

THE PRACTITIONER.

MARCH, 1918.

THE RELATION OF ALCOHOL TO MENTAL STATES, PARTICULARLY IN REGARD TO THE WAR.

By Major SIR ROBERT ARMSTRONG-JONES, M.D., F.R.C.P., R.A.M.C.

Lecturer on Mental Diseases to St. Bartholomew's Hospital; Consulting Physician in Mental Diseases to the Military Command in London; Justice of the Peace for the Counties of Essex, London and Carnarvonshire.

I PROPOSE to deal with this subject in the light of present day knowledge and experience, reflecting firstly the medical opinion, and subsequently that of the general public. I shall, therefore, divide my theme into two sections: firstly, the evident meaning attached to my title, viz., the different forms of mental abnormality resulting from excessive drinking in the individual; and secondly, the different mental states exhibited, or the different points of view adopted, by the community responsible for the methods of its sale and use, and, as a consequence, for the maintenance of public order. In dealing with the latter section, I shall pass in review the different legal measures that have been adopted to control its sale, and the various steps that have been taken to safeguard the health of the people in connection with it.

The question of the effects of alcohol upon the human organism is an important medical point, as well as being an interesting economic and sociological one; for it has a concern with the vitality and with the output of work of the individual, as well as with his relation to the State which protects him and of which he forms a component part. As to the use of alcohol in health, all experiments are in accord, and it would be useless to occupy space with a repetition of the results obtained. Broadly stated, they are: that alcohol stimulates the heart and circulation, in other words, it increases the force and frequency of the pulse and the functional activity of the nervous system; but it tends also to lower the temperature of the body, because it checks tissue changes. It is evident, therefore, that we have in alcohol a drug, which can afford temporary relief in certain abnormal bodily states, but the very relief afforded in one particular direction, viz., as a cerebral stimulant, doubles the temptation to its frequent use, and as the body becomes habituated to its action and the dose has to be increased more and more, the habit of frequent stimulation grows almost of necessity into drunkenness. For this reason, I am of opinion that no physician is ever justified in prescribing alcohol for its purely soothing, stimulating, or narcotic effects, and I have never used it nor advocated its use for the mental conditions described as painful emotional states, because I consider its legitimate use to be for those extremely serious nutritional disturbances such as threaten to be the last moments of life, and in these states I have known it to prolong the life struggle.

Personally, I have no sympathy under ordinary circumstances with the daily use of alcohol by healthy persons who are not beyond middle life, and even such use in health has moral and politico-moral issues which cannot be discussed here; but under conditions of unaccustomed exposure to wet and cold, when the extremities are numbed and have lost or are losing their proper feeling, I have been informed by both officers and men from the trenches that the "rum ration" has enabled these men to withstand the continuous exposure to intense cold and wet. This fact is not in contradiction to the physiological experience already quoted, that alcohol lowers the body temperature and has no heating power. It only means that the chill of sudden exposure, the stiffness from benumbed extremities, and the bronchitis that may follow are the result of cold, which drives the blood from the skin and the general surface of the body to the extremities; that as a consequence of long exposure the circulation fails in the skin, the functions of which are suspended, with the result that the skin ceases to excrete the body waste, normally carried out with perspiration, and that these waste products are now thrown upon the internal organs, which are already in a state of passive congestion. The relief obtained is properly explained by the physiological effects of alcohol, which maintain the increased circulation and keep the external surface supplied with fresh warm blood from the internal and engorged bodily organs. The obvious danger of prescribing alcohol in health is to induce intemperance, but it is only right to state that intemperance is also often the effect of brain weakness and brain disease; indeed, some writers have gone so far as to state that in practically all cases of mental disease associated with intemperance, the latter is the consequence of mental weakness and not the cause; a statement which is probably less than half the truth.

In regard to alcohol, physiology teaches us that alcohol is, primarily, a strong dehydrating agent. It takes away water from living matter, and as a fixed amount of water is a necessity for the life of healthy protoplasm, this dehydrating action must prove to be highly injurious; hence, its effect upon living tissues is to cause a degeneration and decay, which can be seen in the pyramidal or the essentially psychic cells of the brain, with consequent loss of their function and with decided intellectual degradation when they are affected. The higher will power is impaired; the will loses its grip, normal inhibition is removed, so that the person is easily tempted to other forms of indulgences, and we know that the great campaign of the National Council for combating Venereal Diseases cannot afford to disregard the connection between alcohol and the social evil. I have seen young officers, barely 20 years of age, whose army career has been ruined by drink and debauchery. The disposition in those who drink to excess changes into querulousness and impulsiveness; in fact, the most definite mental effect of excessive drinking is the tendency towards the development of a hostile attitude of mind, with the consequent liability to react furiously and intolerantly Alcohol attacks the hierarchy of the tissues, for it has a special affinity for the nervous system; there is a shedding, by degrees, of the most highly evolved faculties; there is a loss of prevision, an impairment of the judgement and a failure in the power of discrimination. Later on, the memory becomes affected, and no amount of reasoning is able to persuade the person who has got into the habit of drinking to give it up, even if it is clearly pointed out to him that he and his family dependent upon him are being pauperized by it.

It is always very difficult to estimate the exact ætiology, even in the most common diseases, but it is impossible to arrive at accurate conclusions in regard to the causation of mental diseases; yet in connection with alcohol, the Lunacy Commissioners, in their Report for 1905, made the precise and definite statement that alcohol, in their opinion, was a "brain poison." Whether it is justifiable to describe as a deleterious poison an organic substance, useless to the individual under ordinary conditions of health, may be a matter for legitimate differences of opinion; but the Lunacy Commissioners made, in addition, the further statement that, although some counties with a comparatively low rate of insanity had a high proportion of cases admitted into asylums with a history of intemperance, there were other counties with a high rate of insanity but with a low proportion of cases suffering from alcoholic intemperance. Nevertheless, in those areas in which there was an association of intemperance and insanity, there was also the definite association of intemperance and crime, which appears to justify the inference that in those areas, in which there may be a high incidence of intemperance there will also be a high proportion of insanity and crime, and it is the considered conclusion, from the definite observation of all social workers, that where there is intemperance there, also, are crime and insanity.

It is interesting to note that when statistics as to the causation of insanity are taken over a series of years, the number of cases appearing as caused by alcohol, as well as by other causes, show but little variation from year to year, and it is computed that alcoholic intemperance may correctly, and without any doubt, be attributed as the assigned cause of insanity in no less than 20 per cent. of all males admitted into asylums, and in no less than 10 per cent. of all the females. When the total number of admissions for the last year of which we have record, viz., 1915, was quoted as 8,600 males and 10,000 females, we can readily see that alcohol was in one year responsible for over 2,700 cases of mental disease in England and Wales, *i.e.*, of persons who had to be compulsorily detained against their will, and who, in consequence of drink, were deprived of their social, civil, domestic, and financial rights, and of whom it may be observed a number will continue under detention for the remainder of their lives. It may be surmised that about 3,000 persons every year become insane through drink in England and Wales.

I have referred to the difficulty there is in arriving at the exact factor of causation in mental diseases, and, as may well be appreciated in this illness, the patient himself is unable to assist the investigator, for, owing to the clouding of his reason, the statements he makes are unreliable, and further, the information vouchsafed by the friends does not help to elucidate the cause, for the reason that they only relate such antecedents in the history as appear to them to bear upon the illness—which are rarely either accurate or full. Moreover, in many instances the cause attributed by the friends only stands in some immediate relation to the illness, and forms no true part of the cause; indeed, it often has little or no connection with it, the real factor being some inherited or acquired frailty or some weakness in the nervous co-ordination, which the friends have either minimized or overlooked, or have carefully attempted to suppress. So often is this the case, owing to the stigma attaching to mental disease, that a studious effort is made by all the relations to lessen the importance of a faulty family history, and to give prominence to trivial and unrelated factors, having no definite causative effect.

From what I may claim to be an extensive personal experience, I am more than ever convinced that in mental disease there exists some *locus resistentiæ minoris* in the brain tissue, which renders the individual more prone to be affected by circumstances which, in the healthy person, would have less influence; and although several antecedents may combine in the ultimate production of a mental breakdown, it is logical to assume that any one of several causes may be the immediate agent responsible for the final breakdown. In regard to this, much depends upon the so-called "immunity" or the individual resistance shown by the person affected, and, as we know, when several persons are exposed continuously to the same infectious fevers, some always escape and do not contract the infection, whilst others appear to take the disease repeatedly, and to suffer, in turns, from almost all the other ills to which flesh is heir.

No fact in biology is more striking than the difference in susceptibility to disease conditions exhibited by different persons and different races, and even by different animals. It accounts for the very different symptoms produced by the same dose of the same kind of alcohol upon different persons. We know, from medical experience, how, in regard to drink, some persons may break down from arterio-sclerosis, hæmorrhage, and cerebral softening; whilst others may suffer from infiltration of the glandular structures, *e.g.*, the liver or kidneys; whilst others, again, rarely suffer from nervous or mental lesions at all, but they break down from more gross tissue changes, and become physical rather than mental cripples. Drink in small doses is literally death to some persons, whereas others tolerate it in large quantities, and the brain worker rather than the manual labourer shows the least resistance to it. As we know, one person may become morbidly irritable and quarrelsome, another may be ludicrously affectionate; a third, stupid; a fourth, vain and boastful; and a fifth, silly; all these differences denoting differences of suspectibility to the same dose of the same kind of alcohol.

The same susceptibility to alcohol and to disease that is seen in persons is also exhibited in the history of races, *e.g.*, the native races in many parts of the world are comparatively insusceptible to yellow fever, to enteric, and to malaria; and we know the same condition to exist in animals, for dogs and goats are rarely tuberculous, and rats, which are not susceptible to anthrax, are only so after fatigue or when fed upon an exclusively vegetable diet, which helps to render the blood alkaline, a reaction which favours the growth of the bacillus; we know, again, that tetanus, for instance, is never met with in fowls. These facts demonstrate that there is a natural immunity or a natural insusceptibility on the part of certain races, individuals, and animals to certain diseases, which may, in the same persons even, vary at different ages, *e.g.*, as age advances, the immunity to diphtheria and to scarlet fever becomes more absolute and definite, and this immunity may be either partial or complete.

Precisely the same sort of immunity or insusceptibility occurs in diseases met with in the use of alcohol, and we are therefore unable to foretell the particular group of neurons likely to suffer in any special case of alcoholic indulgence; nor can we foretell the progress of the symptoms, when a group of neurons has been attacked. All we can assert is, that for every individual there is a spot or place of weakest resistance, which has been arranged for him through natural selection and heredity. For long periods of time, many of the different races have been exposed to alcohol, but the susceptible ones have been weeded out; whilst the survivors transmit their insusceptibility to their descendants, and although this is an observed fact, yet it gives us no physiological explanation of the greater immunity of the insusceptible ones. It is possible that more proteolytic enzymes are produced by the organs of one individual than by those of another in order to destroy or to modify such a toxin as alcohol, with the result that a greater immunity exists in one person than in another. Whether the explanation of this phenomenon is afforded by the *humoral* hypothesis, which ascribes immunity to the action of certain substances existing in or generated by the body fluids, or the explanation can be afforded by the *cellular* theory of the more active phagocytic action of the polymorpho-nuclear leucocytes, or by the *cellulo-humoral* theory of the production of alexins or bacterio-lysins in the blood cannot now be discussed. But it is a well ascertained and an incontrovertible fact that alcohol acts differently upon different persons, and this personal equation of the individual should be taken into consideration not only when discussing the symptoms of alcohol but also when urging legislation for the control of its sale. I have mentioned the subject of immunity in order to show that whilst alcohol may be regarded as a poison—and clearly, in this particular, what is one man's meat is another man's poison—yet, like many other poisons, it can, under certain circumstances, be of distinct service to mankind.

I may say that I believe the consensus of opinion among medical men in the present day is, that in many instances the use of alcohol is to some extent beneficial; but there is a strong section of the thinking public which realizes that alcohol is a lethal weapon which can work the most fell and deadly effects, and that its general use, therefore, needs the most careful and earnest control. We know personally, in too many instances brought to our notice, that alcohol reduces energy, lowers vigour, diminishes initiative, and paralyses enterprise. Many persons, therefore, abstain from it altogether, and use untiring efforts to prohibit its use by others, and this through the highest motives; but it must not be forgotten that total prohibition breeds vices in regard to drugs, sedatives and anodynes. At the moment, the public feeling generally is, that under the control of the normal reasoning and moral faculties the moderate demands of working men and women should be satisfied, *i.e.*, within strict limitations, which is interpreted by public opinion to apply to its use at meals only and only by those who find it helpful in their daily work.

It is often felt by those who watch events, that the logic of facts has to be carefully weighed against the sentiment of an ideal, and if true progress in regard to temperance is to be encouraged, the watchword must be *festina lente.* However excellent the motives, however firm the zeal and unwavering the devotion, progress cannot be forced, and it cannot be pushed far in advance of public opinion. I know how, in regard to the control of the liquor traffic, both feeling and sentiment have run high and with regrettable consequences. It is necessary, in regard to this aspect of the question, to take cognizance of the state of feeling in all classes of the people, and at the moment there seems to be an irresistible popular feeling against the complete prohibition of alcoholic drink, which that great and useful movement the "War-time Prohibition," or the "Strength of Britain Movement" has already had to experience; nevertheless, it has achieved much useful success in its educational campaign, for it has drawn special attention to a social problem that has been too largely ignored. In discussing this problem various aspects of the drink question come under review, and the hygienic, medical, sociological, and ethical aspects all come up for consideration.

In this paper, I propose to deal exclusively with the mental symptoms, viz., those that result from the influence of alcohol upon the nervous system. In discussing this aspect, it may be appropriate to state there is evidence that every psychological state has a corresponding physical state in the brain, for to every psychical process there are special physical and chemical changes in the nervous substance corresponding to it; hence the maxim "to every psychosis there is an appropriate neurosis," which means that every mental act has its appropriate physical correlation. This parallel relationship has been proved both by observation and experiment; it is a joint conclusion of psychology and physiology, and can be definitely supported by clinical and pathological research.

Different parts of the brain, as we know, subserve different physiological functions; thus, one part is concerned with vision, one with sensation, and another with bodily movements and speech. Yet the whole brain acts together, so that when these various parts are affected by alcohol, there occur visual and other sensory illusions upon which are based delusions; in consequence of affections of touch there arise mistaken ideas and complaints about electricity, machinery, hot irons, or the gnawing lacerations of wild animals. It is sensory disturbances in particular, which so often originate delusions of persecution and the violent and impulsive retaliations often associated with drink. There is no better ascertained fact in medicine than that alcohol has a peculiar affinity for that part of the brain which is connected with the "muscular sense." It destroys the co-ordination of the fine sense which interprets the equilibrium of the upright position and that of the limbs, and, as we see in drunkenness, it may bring about motor paralysis. Even before ordinary sensation is affected, the muscular sense may be attacked; so that engineers, delicate instrument makers, mechanics, typewriters, pianists, draughtsmen, and those who do fine work need to be especially on guard, if their educated and delicate muscular sense is to be preserved to them.

It is our fine perceptions that give us the experience upon which we act, and two of our perceptions especially, viz., sight and touch, have been very fully studied experimentally, and it is these that are mostly affected by alcohol. In regard to touch, a composite sensation, we know there are four distinct external receiving organs in the skin: firstly, that giving the measure of pure touch, ascertained by the pressure on the skin of fine hairs mounted in wooden handles and attached to a balance; then the pain spots, indicated by pressing with metallic points; thirdly, heat spots, and fourthly, cold spots, indicated by hot or cold blunt rods. In every instance the response to these is varied by alcohol; the first to go is pain, the next heat and cold, and the last pure touch. These are facts that can be demonstrated by experiment, and are the same as occur when the nerve to the skin is divided.

In speaking of the mind as related to the brain, we realize that its study implies a close investigation of the various senses, which are the avenues leading into the mind. Formerly, the study of the mind was limited to the field of introspection only; but of late years investigation has been carried into mental phenomena by means of experiments, and these have enabled us to examine our sense perceptions with much more accuracy and precision, both under normal conditions and under the influence of graduated doses of alcohol. It is usual to speak of the mind as composed of three types of conscious activities; cognition, or the state of knowing, feeling and sensation, and lastly the will; the two latter are now grouped in the subdivision of interest, but the will is the highest and essentially the most human characteristic of the mind. Of the powers of the mind, the memory is one of the most fundamental as well as the most important, for without memory we should be unable to co-ordinate the different states of consciousness, and we should also lose our personality; results which we see occurring after the excessive use of alcohol. The facts which come into the mind to be grouped together by association—like to like and unlike contrasted with unlike—remain endorsed upon it through memory, and the main facts in education are to form time-saving and correct associations. Discipline is a matter of association—a body of well-trained troops only needs to hear the first of a series of orders to carry out the whole train, for one is linked to the next by association. The power of constructing and carrying out trains of thought by association is described as the power of apperception, which is the focussing power of the mind, and it is this faculty of attention which is the first to be impaired by alcohol; it may be temporarily suspended or it may be permanently destroyed.

There has been much confusion as to the use of terms in dealing with the effects of alcohol, and the term alcoholism has received widely different meanings. Mr. Leif Jones (President of the United Kingdom Alliance), in an address to the International Congress at the Hague in 1911, used it as signifying the total consumption of alcohol by a people; whereas others use it to imply the measure of the mortality from strong drink, indicated by mental and physical symptoms leading to fatal results, and recorded in the Registrar-General's statistics. The most common effect of the excessive use of alcohol is drunkenness, and the symptoms of this are too well known to need description; but there are three very different types of drunkenness; firstly, there is the periodic drinker or the dipsomaniac, who imbibes freely and deeply, but only occasionally, whilst during the intervals he may abstain completely; secondly, there is the person who literally soaks in alcohol, who is hardly ever sober, and is the person described as the "habitual drunkard," who swells the police court lists, until eventually, owing to the progressive lesions and their lasting effects, his death is recorded in the Registrar General's statistics as a case of alcoholism; and, thirdly, there is the ordinary drunkard, who drinks from pure conviviality, and only needs the congenial pals to spend all or most of his money whenever he gets it, and thus to lower his productive efficiency. He is the typical Saturday night and Sunday drinker, and he almost invariably gets into the hands of the police and figures in their statistics. It is this person, who is the average worker, and upon him the State depends.

Strictly speaking, neither of these terms signifies the amount of alcohol consumed, although the statistics of drunkenness may, speaking broadly, be the most reliable index. As we know, there may be a considerable consumption of alcohol with a comparative absence of drunkenness, and for this reason it would be more convenient to regard alcoholism as a social disease, of which drunkenness—whether of the periodic, the chronic, or the occasional kind—is one of its forms. If drunkenness may be taken as an index of the amount of drink consumed, the number of deaths from cirrhosis, delirium tremens, dropsy or Bright's disease may be taken as the index of the incidence of this social disease. It has been asserted by some critics that a diminution in the numbers of cases of drunkenness may imply even more rather than less drinking, because those persons who, under the present restrictions, have a difficulty in obtaining alcohol, may drink privately and secretly in their own homes; but this is denied by all social workers, and is contrary to the observed experience and the recorded inferences of all those who know the homes of the people.

Whatever importance or value we give to these terms, it must be the question of immunity or the insusceptibility or vulnerability of the different organs of the body, which is the determining factor as to whether a person comes under the definition of drunkenness, habitual drunkenness, or alcoholism. We here employ the latter term to signify all the pathological changes which result from alcohol, and to include all the varying symptoms, whether mental or physical, and whether these occur in hospital, asylums, police courts, or the private home of the individual. Alcoholism must be the total effects of the use of alcohol, of which drunkenness is probably the most convenient, if superficial, indication, and it is drunkenness in one of its many forms, sensory, motor, mental, or moral, which is the most common indication of excess.

Of the various forms of mental impairment caused by alcohol, the most dangerous, because the most violent and impulsive, is *delirium tremens*, which occurs in a fifth of all cases of alcoholism, and in consequence of continuous alcoholic intoxication in those persons who are liable to mental and sensory hyperæsthesia, is associated with extreme agitation, tremors, night hallucinations, and insomnia. The symptoms are too familiar to be further detailed, but probably thousands of these occur and recur annually.

Another form of mental affection not uncommon among the civil population, although, fortunately, rare among the military, is that of multiple neuritis associated with mental symptoms and commonly called Khorsakow's psychosis. It is characterized by a loss of memory of a peculiar kind. There are gaps in the recollection of past events, which the person fills up with events that have never happened, but are suggested by some trifling incident in the environment at the moment; for this reason, he is said to lie shamefacedly, but this is only because the memory is a blank, and he is unable to retain impressions of his own statements, causing a peculiar forgetfulness as to time and place—a loss of orientation. There is here an impairment of that special adhesive quality of the nerve cells, by which the healthy brain is able to retain the images of past sensations, and by means of which thoughts are retained in a clear, regular, and logical order. This form of loss of memory is described as *paramnesia*, and is most indicative of alcoholic indulgence.

A third form of mental affection through drink is one closely related to epilepsy, and this is greatly favoured by a head injury or some predisposition to mental disease. It is accompanied with sudden frenzy and fury, and is not infrequently associated with unconsciousness, and possibly also epileptic convulsions, but if these are absent, pronounced "automatism" and complete forgetfulness of what has previously occurred develop. In these attacks the person may commit acts of serious violence, even suicide or homicide, and there is an imagined hostility to his environment, which calls for resistance or retaliation; but this condition ceases entirely with abstention from alcohol, although an immediate relapse may occur when excessive drinking is again resumed, and it may be noted that this excess may be a very small amount of alcohol, for in these persons there is a particular suspectibility to its effects. I have met these cases repeatedly in civil practice, and also in the case of young officers who have suffered from head injuries.

A fourth form of mental affection is an unrestrained excitement, caused by the presence of vivid hallucinations, and, again, it is the susceptible brain that suffers rather than the normal person, for very little alcohol may produce these delusions, which are vivid and terrifying. The hallucinations may induce a chronic delusional state, from which there is no recovery, and this condition much resembles that of paranoia with delusions of suspicion and persecution. It is essentially a chronic form. Lastly, there is the state of terminal dementia, in which the mind gradually fails until the mental wreckage is complete. Whether a case evolves from slight mental confusion through the different mental states into fatuity and dementia as the result of alcohol, must depend more upon what has already been referred to as the peculiar suspectibility of each individual rather than upon the quantity or the quality of the alcohol imbibed. It is certain that all young persons in health are better and fitter without it, as also are older persons with a neurotic family history.

It may be stated correctly that there is much in common between all the forms of mental disorder associated with alcohol; there is an undue suspicion in all against their environment, and if delusions are present, they tend to be of a persecutory nature, for even when they partake of a grandiose character, there is frequently the suspicion that the victims have been robbed of their rank, position and wealth. Their hallucinations mostly relate to sight and touch; imaginary objects are seen moving, crawling, or creeping over them, and they complain of being burnt, electrified or tortured. The memory is invariably affected for recent events, although it is more correct for remote events, and their actions are predominantly impulsive, purposeless, and unreflective; they make imaginary journeys, and relate what seem to be plausible assaults committed upon them, which they resent and which they intend to repay their fancied enemies with interest. Lastly, there is the invariable moral and intellectual deterioration shown by the offences committed against public decency and against the amenities and conventions formerly so correctly observed, so that the alcoholic ends by becoming an object of reproach to all his former friends and associates.

I have already referred to the impulsive and dangerous acts committed by persons under the influence of alcohol. In some instances, these resemble the uncontrollable fury of epileptic mania, which, in my opinion, is the most furious and savage violence that can be seen in any individual, for it seems like a tornado of wild impetuous destructive rage. Under the influence of alcohol the most rancorous and loathsome cruelties have been perpetrated upon innocent victims, the most bitter hatred has been shown, whilst prudence, moderation, and altruism have disappeared under its influence.

We have it officially recorded that the most brutal excesses followed in the track of the drunken German troops in Belgium and in Northern France, for after they had emptied the cellars of the French châteaux they ransacked the furniture and priceless contents, and then lay upon the floors in stuporose semiconsciousness; whilst at Rheims they behaved with ferocious cruelty, and in the dug-outs of the Somme battle our men found German officers helplessly drunk and filthy. The account of eight drunken German soldiers returning from Malines is authoritatively quoted, and relates that when a little child ran out into the street as these drunken Huns passed by, she was bayoneted by one of their number, slung up and thus carried away whilst his comrades sang. The organized cruelties and atrocious outrages carried out by gangs of drunken German soldiers, the assaults committed upon helpless women and children will remain an eternal disgrace to the military forces of Germany and those in authority over them.

The German medals struck to commemorate the foul murder of the helpless passengers on board the Lusitania will for ever remain a shame and a reproach to German honour, and drink has most frequently been at the root of such actions. I have personally witnessed the mental breakdown of innocent women from Flanders, who were driven into madness by the coarse savagery of German officers and men, whose animal nature was set loose and whose instincts and brutal desires through drink were no longer inhibited by the control of the higher faculties. Some of the horrors of German atrocities have already been fully and accurately described with great moderation in the Bryce Commission's Report and other records. The German troops, as well as the higher commands, have always shown a mad brutality as well as a sordid love of malicious destruction, and they have delighted in destroying everything beautiful and irreplaceable.

I have already referred to the use of alcoholic liquor as an ordinary article of diet, and I consider it a dangerous temptation to the younger officers. The following extract from the letter of a young officer supports my view. It is written from a Divisional Headquarters, "Somewhere in France," and it runs as follows:— . . . "It is very hard for the teetotaller out here, as it is not safe to drink the water unless it has chloride of lime in it, and this makes it taste simply foul. I am at present drinking very light French beer, which is much better for me than whisky."

Quite different, in my opinion, is the use of the "rum ration" in the trenches. I have spoken to Army chaplains about this matter, some of whom are life abstainers, and have served in the front trenches; these men speak of the value of medicinal doses of alcohol against cold and wet and exposure, but one and all condemn the *estaminets*, where the men are served with mixed poisons with special intoxications of their own, yet all are labelled with the indefinite name alcohol. The chaplains are naturally in favour of the dry canteens, which many of them manage, but most of them are in favour of permitting light wines, beer, and spirits during meals. if only the *estaminets* could be considered by the commanding officers to be "out of bounds;" some of the chaplains are ready to buy and sell drink at the canteens for the sake of the men, if their use is limited to meal times and the *estaminets* are forbidden.

That this is a most difficult matter will at once be acknowledged, and that there are different views in regard to it is also natural. The two letters which appeared in the *Times* on December 17 last show how opinions differ in regard to drink. They also show the different standpoints from which the critics view the present condition of things in regard to alcohol. One of the letters is from Dr. Grenfell of Labrador, who is a well known social worker. He states that the American soldiers show an absolute freedom from drunkenness and a small amount of immorality, but when they get to England and France " they will get all the alcohol they want, and therefore also the danger that comes with it." In the same number of the *Times* Mr. W. T. Ellis writes that he has just arrived in London from Russia, and his own impression after four days of observation was in striking contrast to the suggestion of Dr. Grenfell, who is a strong prohibitionist. Mr. Ellis writes, " I have yet to see a drunken soldier here, or one behaving in any way that reflects discredit upon the Allied flags." To the man in the street the real truth must lie between these two extremes, and it is interesting to reflect upon the mental state of the critics themselves. I may add that during the whole of Christmas week, whilst going about freely in London, I did not meet a single drunken person.

To summarize the effects of alcohol upon the mind, we may repeat, firstly, that there are the various degrees of mental confusion and motor inco-ordination described as drunkenness, which are mainly of three types, viz., the periodic kind shown in the dipsomaniac, the more or less continuous form seen in the habitual drunkard and the occasional; secondly, the state described as *delirium tremens ;* thirdly, the combined condition of neuritis and psychosis; fourthly, the convulsive and automatic state; fifthly, that of chronic hallucinations and delusions; and lastly, the terminal state of fatuity and dementia. It may be stated broadly, that all forms of mental affections brought on by alcohol, or associated with it, may be subdivided or referred to one or other of these groups. I am leaving out of this contribution that fatal malady described as general paralysis of the insane, which, in my opinion, has a close though indirect relation to alcohol. It is a mental and physical disease which affects young men in the Imperial services, particularly in the Army and Navy, and owing to this disease probably 1,000 males in this country—those of the best and most adventurous type—are destroyed annually. Side by side with this is the mental, physical, and moral destruction of about 500 women from the same cause.

Let me now take the second section of my theme and briefly refer to the mental states shown by those responsible for the sale and control of alcoholic drink which have ranged between a mild endurance and extreme intolerance. As we know, the question of drink is by no means a new one in this country; indeed, drunkenness as the consequence of drinking is the oldest of the vices, and has been known in every country from very ancient times, whereas alcoholism, or the pathological conditions produced by alcohol, is a development of civilization.

The statutory licensing of ale-houses began as far back as 1495, but it was not until 1606—to use the words of the Act —that "the loathsome and odious sin of drunkenness" was made a statutory offence punishable by fine or confinement in the stocks. Throughout the Middle Ages the provincial and the diocesan ecclesiastical courts exercised an active and strict jurisdiction in regard to moral correction, and sternly punished the "infamous and offensive" sin of drunkenness. Apart from special local legislation, the early statutes of 1606 continued until 1872, when the Licensing Act of that year made it an offence, punishable on summons by fine, to be found drunk in any public place or on any licensed premises. There was more activity in regard to drink legislation during the "70's" than in any consecutive ten years before or after, and not until the Licensing Act, which came into force on January 1, 1903—as a result of a special Royal Commission described as the Peel Commission—was there any concerted effort made to diminish the number of public houses proportionately to the population.

This Act made it a penal offence for a person to be drunk and incapable on any licensed premises or in any public place, and a drunken person, if in charge of a child under seven years of age, became liable to imprisonment with hard labour for the period of one month, and information in respect of this offence and even the arrest itself may be made by any person. A special feature of this Act was the "black list," a system by which the offender if convicted for drunkenness four times in the same year may be either fined or sent compulsorily into a reformatory for any period up to three years. The police provide photographs of the offender (with details of previous convictions) to all licensed premises and to all secretaries of clubs within the district of the court, and if drink is afterwards supplied heavy fines may be imposed upon those who sell. This Act aimed at protecting the home and it *tended* to make it impossible for drunkenness to become the curse and ruin of an innocent family, and in addition the Act gives power to control the structural arrangements of all public houses, so that no alteration is possible without the consent of the licensing justices.

The Act was an effort to repress the abuse of alcohol rather than to restrict the sober person; yet, since the passing of the Act and for several years up to 1914, there has been a gradual rise in convictions for drunkenness of both males and females; the "black list" also, in spite of good intentions, has become a dead letter. So that although there has been a steady diminution and reduction of public houses—partly by order of the licensing justices and partly also by arrangement with the brewers—it was not an infrequent occurrence for county councils and other authorities, as well as for local residents, to petition the licensing justices to diminish the number of public houses, on the grounds that facilities to obtain drink not only increased the temptation for people to drink but also encouraged the desire; the petitioners in this instance feeling that the class of the very poor should not be swelled with continual recruits through drunkards and their families being brought into them from all the other classes.

Indeed, so serious had matters become, six months after the war, through drunkenness, impairment of health, loss of workmen's time and general bad temper, in places where a large population had congregated for munitions and other government work, that the present Prime Minister described the drink as a worse enemy than the submarine. In June, 1915, the Liquor Traffic Control Board (with Lord D'Abernon as chairman and Mr. J. C. G. Sykes as secretary) was instituted by the Parliament of the people under the Defence of the Realm Act, and it must not be forgotten that the enactments and regulations of this Board have the force of an Act of Parliament. This Board set to work at once with a definite policy, which was to *stop* continuous drinking and to *modify* drinking at frequent intervals, especially during working hours, because these indulgences were believed to be the root of most of the physical and mental troubles and disabilities among workers, and the Board hoped to discourage all drinking except at meals.

The work carried out by the Board in such areas as Carlisle and Enfield reads like a romance, but it would probably have been impossible if Parliament had first appealed to the country asking for the powers they have exercised. In Carlisle, the Board have closed many of the public houses and some of the breweries, and have themselves taken over the enterprises carried on formerly by these as well as by the wine merchants. They have placed disinterested managers in charge of their houses, who were not to profit by the sale of drink, but only by the sale of food; the hours of opening were restricted to those of meal time, the sale of spirits was to be discouraged, none to be issued to those under 18 years of age, and, in addition, a very important feature, all drinks were permitted to be diluted. They have further arranged for entertainment and recreation to be provided for persons frequenting their premises, and they have power to provide postal and banking facilities for their customers. Moreover, they have arranged for their own inspectors to visit and examine all premises and clubs within their controlled areas, in order to insist that the regulations were carried out, and, lastly, they have established Sunday closing.

It is not fully appreciated by the public to what extent the Regulations of the Board have succeeded, and it is only short of marvellous to realize that these now control thirty-eight millions of the population of this country; it may be surprising also to know that the Board has not acted in a single instance without an application to do so being presented by the local naval, military, transport or munition authority. May we ask with what results the Board has acted? Throughout London and in forty towns with over 100,000 inhabitants, 159,000 convictions for drunkenness in both sexes occurred before the war, whereas in 1916 these had diminished to 77,000, or less than one-half. In London alone last year nearly 20,000 arrests were made by the police for drunkenness, with "incapability" and disorderliness as qualifications, and this number is less than half the number during the first year of the war.

In all the areas where the Board has exercised its powers, the streets have become more decorous, the station platforms more orderly, the people more tranquil and crowds less excitable; workers have been healthier and their minds less irritable; there has been more contentment among the mass of the people, who are more reasonable and have got through more work. In addition, there has been a reduction by one-half in the number of cases of *delirium tremens*, especially in places where men collected in large numbers, and where many of them drifted, through drink, into the Poor Law infirmaries. The results in all areas have been perfectly astonishing, although these are only a few of the attainments of the Board, and these results have been testified to by chief constables, medical officers of health, district workers, nurses and even by members of the licensing trade itself. The police court statistics have supported the statement made that drunkenness among men and women has diminished by one-half.

Yet what do we find among some of the critics? These are described as extreme temperance advocates, whose whole-hearted efforts are said to be in the public interest, yet, in regard to the control of the liquor traffic, are "neck or nothing." They have offered to the policy of the Board an uncompromising opposition, and in place of the scheme of purchase and control, so successfully carried out by the Board, they advocate a scheme of total prohibition. They offer a flat contradiction to the Board's statistics, and to support their opposition they repeat the statement that, in spite of the restrictions generally imposed by the Board, since the war there has been a continuous increase of expenditure on intoxicants—which was 12 per cent. higher in 1916 than in 1915, and 24 per cent. higher than in 1914—and that the amount of money spent upon alcoholic liquor in 1916 was higher than in any previously recorded year, in fact the highest yet recorded. Still this can be accounted for by the high price paid for drink, which means that although the nation spent more it drank less, and the revenue received less money. These opponents also assert that if there has been a diminution of drunkenness, which is not admitted by them, there has been more private drinking, which is denied by all those most competent to judge, or they state that the police have been more lax in their supervision of drunkenness since the war, which is an aspersion upon the police. What are we to think of mental states, that can direct such a virulent and vehement crusade against the work of the Board of Liquor

Control?

The following is the criticism made in the leading article of the *Times* of December 26 (1917), "the diminution of intemperance among women will not be welcomed by those intemperate advocates of temperance, who regard the total prohibition of the liquor traffic as an absolute good in itself. Some people seem actually to prefer an increase to a diminution of drunkenness, because it is a lever for promoting their cause and they will criticize and deny the evidence quoted in the report of the Board, viz., the fact that there has been a diminution of drunkenness as shown by the average weekly number of convictions—which has fallen from 700 in 1914 to 239 in 1917. These specious critics assert that police statistics are notoriously unreliable; that the fall in these has been more than overbalanced by an increased home drunkenness, and that public excesses have been replaced by secret drinking," which, of course, is not the case.

The local Carlisle journal's reply to this criticism reads as follows: "The improvement (in Carlisle) is as noticeable in the orderliness of the streets as in the official figures of decrease in convictions for drunkenness, and to the citizens this return to good order must be highly gratifying, and not only are the numbers decreasing in comparison with previous years, but the improvement still continues and is very pronounced."

Nor has this hostility been limited to the work of the Board; one member of the Board himself has been the recipient of the most unmerited abuse and contempt on the part of this extreme wing of the temperance party. Nor was their example long before it was taken up by other discontents. The Labour Council in Carlisle saw in Sunday closing an interference with the workmen's comfort and freedom, and they naturally demanded a reconsideration of this matter by the Central Board, with a request to return to the former hours of opening. The whole matter was referred to the local advisory board, which apparently took the side of the Labour Council, but the Central Board very wisely decided there was not sufficient reason to go back upon their decision, suggesting that whatever determination was arrived at would always find some conflict of opinion either for or against. The matter is possibly not yet closed, because the Labour Council have decided to make further representations, and it is earnestly hoped that the trouble started by the extreme wing of the temperance party will not be the means of stirring up labour troubles in Carlisle. In addition to the complaints of the Labour Council, there has arisen an acute opposition from the Midlands and again on behalf of the prohibitionists, but apparently originating in an insignificant quarter.

It is quite well known that before the Central Board came into being, the policy of regulation and restriction under private ownership had already received a fair trial throughout the country, but it is also equally well known that it had reached its effective limits and something practical and immediate had to be done. No one denies that to the idealist temperance reformer—may we say not only to the mind of the total abstainer—prohibition as an ideal has undoubted public advantages over any system of State purchase, precisely because this has merits that are immeasurably superior to the scheme of the Improved Public House, as it is called, advocated by the self-denominated True Temperance Association. But the work of the Central Liquor Traffic Control Board has, by an overwhelming consensus of public opinion, advanced the cause of temperance, yet there has been this incomprehensible attitude against its members and against its work, and, more incomprehensible still, this attitude has been excited and fomented by those who should be its best friends.

What is the psychological explanation of such opposition? I am of opinion that this intolerant exhibition of superiority, deliberately shown by this extreme section, is based upon a morbid form of egoism; it is a consequence of self-gratulation and self-esteem, which borders upon an obsession, and is regarded by some authorities as pathological! Most of us will acknowledge that all excellences require some comparison to demonstrate their advantages, but when specious reasons are advanced to support them, and these are mingled with personal attacks, then such criticism passes beyond the limits of legitimate argument. A person who argues from selfish ends and from a feeling of personal superiority over others, is very apt to dry up the wells of truth in order to justify his point of view. Nor is such a person contented to stand alone, but, as we see in this instance, he courts the sympathy of others—whoever they may be—and so long as his own views are furthered, he will even sacrifice his own sense of honour in his effort to bring the opinion of society against his opponent and to throw discredit upon his views. No form of hostile criticism is so unendurable to a sensitive, high-spirited nature as the disapprobation of his fellow-men and fellow-workers, and it is a favourite device with the advocate of a weak cause not only to excite public opinion against his opponent, but also to heap upon him as much private contempt as possible, with the sole object of forcing him through this vituperation and scorn to modify his attitude, and this irrespective of the public good.

We have used strong words in criticizing this conduct of the extremists, and we know that this virulent and vehement opposition is not supported by public opinion. Let us be thankful that, in the best interests of this country, we have had a strong and energetic Board which has created a great change in the habits of the people as a war-time measure. It behoves us to think of what is to happen after the war is over. The period of demobilization is going to be a serious trial, especially to us who have to bring our brave men home from far distant seats of war, and all our men will be returning to find things very different from what they were. As Major Eccles said, " scenes of drunkenness will be a dishonour to a nation that has been fighting for right and righteousness." It is our duty to urge that the best conditions for employment shall be provided for our damaged men. There will be many difficulties after the war; there may be destitution, and there certainly will be shortage of food and money. The question of the control of drink must be one of the first considerations, and are we giving it the amount of thought it needs? Our present mental attitude is too apathetic, and if we do not awaken now, we shall be confronted with far greater menaces than we have hitherto faced; at any rate, we can rely upon the standing example of what has been achieved by this Board even during the stress of war.

◆

THE DIFFERENTIAL STETHOSCOPE AS AN AID TO THE DIAGNOSIS OF MYOCARDIAL CHANGES.

By O. LEYTON, M.D., D.Sc., F.R.C.P.

Physician to the London Hospital.

It is difficult to decide whether the enthusiastic or the polemical writer departs the further from the truth.

The enthusiast develops the obsession that there is only one view worth considering, and that happens to be the one he holds ; whilst the polemical writer demolishes to his own satisfaction the substantial arguments with which he does not agree, and then proceeds to create fictitious views which he ascribes to the medical profession in general, and has but little trouble in proving them incorrect. It is my desire to avoid enthusiasm and polemics.

More than twenty years ago I was taught, that when I examined a patient *complaining of symptoms suggesting disease of the valves of the heart*, I ought to arrive at the diagnosis as to which valves were diseased, and how diseased, by methods other than auscultation. The duty of the stethoscope was to confirm the diagnosis.

The importance of the fact, that this is only applicable to patients with cardiac symptoms, cannot be exaggerated. In some patients without symptoms, the stethoscope supplies the sole evidence of the disease.

Perhaps reference to a specific instance may make my meaning clear.

A child is admitted to hospital with acute rheumatic fever. The micro-organism causing the fever leads to an alteration in the myocardium, pericardium, and endocardium. A murmur develops, due to mitral incompetence caused by dilatation of the heart. The child is given sodium salicylate and kept at rest in bed. The fever subsides, the heart returns to normal size, and the systolic murmur disappears. The patient leaves the hospital apparently cured. On listening to the heart of the child some months later, a presystolic murmur is noted, a murmur which persists indefinitely.

The murmur is now due to adhesion of the mitral flaps. The child may not have any *symptoms* of any cardiac mischief. In that case, the stethoscope would supply the sole evidence of valvular disease of the heart. Other signs and symptoms may develop later.

Before passing to the main object of this paper, I should like to enter a protest against the tendency at the present day to ignore valvular incompetence.

It is true that many systolic murmurs heard over the mitral area are not due to mitral incompetence; these have had many names given to them, amongst them functional murmurs, and for the last thirty years it has been recognized that they may be treated with contempt.

Valvular incompetence means a heart with diminished efficiency. Because we meet a number of men with mitral incompetence, who are able to lead strenuous lives without discomfort, we are not justified in holding the view that the valvular lesion is of no importance. The fact that an individual with mitral incompetence is able to climb a mountain without distress, does not mean that he would not break down fairly soon if he were to adopt the profession of an Alpine guide. It appears to me to be a fallacy to assume that, because a man with a diseased heart is able to perform a certain amount of work without distress, that amount of work repeated frequently will prove harmless.

Many of us have met men who have drunk a bottle of whisky a day for years, and apparently enjoy perfect health; but we do not advise the postponement of the decrease of alcohol until cirrhosis of the liver, or some other morbid condition, has made itself evident.

The force of the simile becomes more obvious as two questions :—Why advise a patient to diminish whisky before there is evidence of it having produced disease, when we know that many men can take large quantities and reach a hale old age? Why advise a patient suffering from mitral incompetence to diminish any strain thrown upon the heart before there is evidence of a disordered circulation, when we know that many men lead long and arduous lives with mitral incompetence? The replies are identical.

In both cases, when the damage has been done, it is beyond repair, and in neither case have we any method by which we can determine whether the particular patient under consideration will prove to belong to the favoured class which can reach old age in spite of the abnormal condition.

Perhaps the view that valvular disease is not sufficient reason for excluding men from the Army, will make the Pensions Committee spend more money than the cost of several super-Dreadnoughts.

The main thesis of this paper is not to point out that murmurs may indicate disease of the heart, but that certain alteration in the sounds of a heart, which is free from murmurs, may indicate myocardial changes. This is nothing new; the tic-tac rhythm of hearts affected by toxins, elaborated by various micro-organisms, was demonstrated to me as a student.

There are many intermediate stages between the normal sounds and the so-called tic-tac, and it is to these I wish to refer. That the sounds assist in diagnosis and prognosis, the following cases will demonstrate :

A well-built man, aged 35, complained of occasional attacks of faintness and asserted that from time to time he lost consciousness. He also complained of pain in the chest. He said that he had consulted several physicians who had diagnosed dyspepsia, but that one had examined him with the electric cardiograph and told him that his heart was weak. Upon examination I found that the first sound at the apex and the second sound at the base were of equal intensity. This is abnormal, the first sound at the apex should be double the intensity of the second sound at the base. This led me to diagnose myocardial degeneration.

The man was admitted into hospital, where polygraphic tracings were taken ; these did not demonstrate any morbid condition. The search for microbic infection proved fruitless, but the Wassermann test was positive. The man died from syphilitic myocarditis before antisyphilitic treatment could be carried out.

The reverse has also occurred.

A woman æt. 32, consulted me about nine years ago saying that she had just seen an eminent physician (whose death we deplored several years ago), who had told her that she had degeneration of the muscle of the heart and could not live more than seven years. Probably this expression of opinion was elicited after considerable cross questioning, anyway the woman was much depressed. The differential stethoscope failed to show any evidence of myocardial degeneration.

The question then arose how could the patient be reassured, because naturally she refused to believe that my statements had any other purpose than to comfort her. The following suggestion proved of value: I told her to return to Sir X. and ask him to consent to a deed being drawn up to the effect that, in exchange for my paying him 50*l.* per annum for seven years, he or his executors should pay me 100*l.* a year after the seven years until her death. The woman is alive and well to-day.

In order to make this experience of value, the method of measuring the ratio of intensity of the first sound to the second sound must be explained in detail. An instrument is required, and it goes by the name of the differential stethoscope.

*The differential stethoscope has to be manufactured with much greater care and attention than an ordinary one, because every detail in its mechanical construction is of importance. It consists of an aluminium box, divided into two chambers by a sound-proof diaphragm, which is pierced in its centre by a sound-channel, through which the heart sounds pass *en route* to the observer. Into this sound-channel fits an obturating cone, which can gradually be withdrawn and replaced by turning a small disc. When the cone is withdrawn, it leaves open round it an annular sound-channel, which varies in area in accordance with the amount of withdrawal. The range and relative sizes of these areas are the important feature of the instrument.

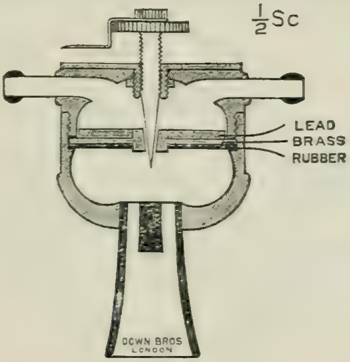


FIG. 1.

It will readily be seen that these areas are governed by three factors, viz., the size of the channel, the angle of the cone, and the amount of its withdrawal.

---

* If there is any merit in the instrument, it is due to the ingenuity and skill of Mr. Guy Drew, of Messrs Down Bros., who has given invaluable assistance in its construction and supervised its manufacture.

If these factors were so arranged that the cone was entirely withdrawn by one revolution of the disc, the relative values of the sounds which would disappear at the ten main points indicated on the dial, would be—

1. 1·02 1·04 1·1 1·2 1·3 1·5 1·9 2·7 5·2

that is to say, that the disappearing points of the sounds on the instrument would be wide apart on three quarters and then cramped together on one quarter of the dial; such a chest-piece, therefore, would be insensitive.

If, however, the instrument is constructed with the size of the air-channel, the angle of the cone very acute, and the amount of its withdrawal properly arranged, the range indicated on the dial would be, approximately:—

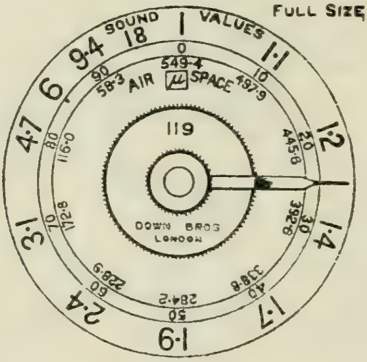


FIG. 2.

1. 1·1 1·2 1·4 1·6 1·9 2·3 3·2 4·7 9·4

This range has been found excellent in practice.

The air-channel in every instrument differs slightly; this is partly due to the tuning of the instrument after its construction. No two instruments are, therefore, exactly alike, and the above range will occasionally vary in one or two of the decimals. Each instrument, after manufacture, is carefully tried and after its sound-conducting powers have passed the necessary tests, the area of the annular sound channel at each of the points on the dial is calculated and recorded in square micro-millimetres. The reciprocal of these areas is also recorded in large plain figures on the dial. These figures give the exact relative value of the sounds which disappear at these various points.

The true centring of the diaphragm is of extreme importance, and, therefore, the chest-piece should not be taken to pieces except by a mechanic who has become an expert in assembling this instrument.

In order that observations may be accurate, a few details must be noted, details which seem almost too obvious to need mentioning, but since they have not been recognized by users of the instrument it is advisable to record them. The chest-piece must be attached to rubber tubes at least 2 ft. long and preferably of not a very thick wall. Physicians accustomed to work in the out-patients' department of any hospital usually have rubber tubes of this length, because it is rather more than that of the jump of an average pulex irritans.

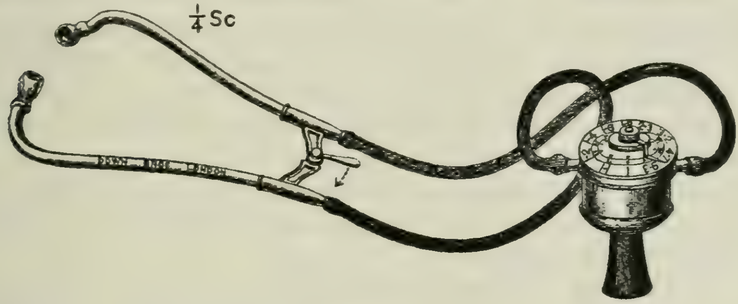


Fig. 3.

The object in having long tubes, when making observations with the differential stethoscope, is to permit of the movement of the chest-piece from one area to another without moving the ear-pieces.

The rubber tubes should be attached to some appliance with a locking nut rather than a spring, so that the ear-pieces may be fixed in the ears, and the risk of their being moved, whilst observations are being made, may be reduced to the minimum. The reason why the walls of the rubber tubing should not be too thick is to prevent the conduction of sound along the walls; the sound should be air-borne only.

That these details are not purely theoretical but also practical, may be proved with the greatest of ease.

Open the chest-piece one revolution, fix stethoscope ear-pieces, apply it to the aortic site, turn disc until the second cardiac sound is just not audible, note position of pointer; move ear-pieces in ears, and make another observation. In all probability the two observations will not be identical; but if the ear-pieces are not moved, a long series of observations may be made varying very little from one another. This demonstrates the necessity of the ear-pieces not being moved whilst the observations are being made with the chest-piece applied to the different valvular sites.

The method of using the instrument is to open it one complete revolution, fix ear-pieces into ears apply chest-piece to apex of heart, which is under investigation, and then slowly turn the disc in the same direction as the movement of the hands of a clock until the first sound is no longer heard. On moving the disc back a little the first sound is heard again. The position of the pointer at which the sound is first lost is recorded. The stethoscope is then opened one revolution again and applied to the aortic site, and the disc slowly moved until the sound is just lost. The position of the pointer is recorded. If the heart is normal, it will be found that the intensity of the first sound at the apex is double that of the second sound at the base.

A little practice may be needed by some to train their sense of hearing to recognize a weak sound, and to make the point of disappearance of the sound fairly sharp.

The instrument allows the intensity of the sounds at various sites to be compared, but so far the most attention has been given to the apical first and the aortic second.

When the ratio of intensities of the apical first sound to the aortic second sound departs greatly from 2 : 1, one may suspect an alteration in the myocardium; this alteration may be of a transient nature.

Some time ago I submitted the instrument to the following test: The ratios of the heart-sounds of eight soldiers were recorded without my being told anything about them, except that they had all been labelled "soldiers' heart." I found that only one of these had a variation from the usual 2 : 1, and his was 1 : 1. This soldier had had dysentery; the other seven were cases of circulatory trouble following severe shock.

Perhaps the quickest way of satisfying oneself that toxins lead to alteration in the relative loudness of heart-sounds, is to take a differential stethoscope to a fever hospital. Diphtheria and scarlet fever will be found to have a very distinct effect, fortunately transient; possibly the differential stethoscope is the best guide in determining when a patient may get up without running any risk of dilatation of the heart or graver consequences.

Please do not conclude that, because the ratio of the heart sounds is not modified to the greatest extent in those that have apparently had the most severe attacks, therefore the instrument is fallacious.

The susceptibility of the heart-muscle differs in different individuals; one man may have a comparatively light attack of diphtheria and severe alteration in the heart-muscle, whilst another may have much membrane and swelling, leading to the necessity of tracheotomy, and nevertheless the heart-muscle may escape. The effects of anti-toxic serum must be considered. Post-diphtheritic paralysis, too, is not limited to the severest cases.

Before recording results, I should like to meet some criticism which has been raised.

Let me assert as strenuously as I can that the differential stethoscope is only one of several methods of determining myocardial degeneration; possibly it is not the best, but I think that it is the most convenient known at the present time. Anyhow, depreciation of one method does not enhance the value of another.

Criticism is of immense value, and even if my replies to some critics contain scant courtesy, nevertheless I am grateful to them for giving me the opportunity of considering and answering them.

The main points have been :—

1. The instrument does not measure sound values.
2. The intensity of the heart-sounds depends so much upon the thickness of the chest wall that the measurement is valueless.
3. The intensity of the heart-sound bears no relation to the condition of the heart-muscle.
4. That the heart-sounds depend upon so many unknown

factors, that their estimation cannot permit of any deduction.

5. That the other methods of examining the myocardium are so perfect, that the differential stethoscope is superfluous.

1. At a meeting of the Hunterian Society, Dr. B. said that a short, sharp sound could be heard through a smaller orifice than a louder, long drawn-out sound. This either begs the whole question of measurement of sound, or probably, what he really meant to say was, that for the same expenditure of energy a sound of short duration is louder than one of longer duration of the same frequency of vibration. This latter statement is true, but has no bearing upon the matter under discussion. The instrument does not measure energy expended, but intensity of sound. Nothing is gained by saying that one sound is louder than another, unless the method of determining the loudness is recorded.

2. It is quite true that the loudness of the heart-sounds depends upon what intervenes between the heart and the stethoscope, and therefore, in my opinion, an absolute measure of the energy of a heart-sound at the skin surface would be of but little value. With the differential stethoscope the intensities of sounds are compared. If the patient is fat, probably the fat will be symmetrical ; if emphysematous, probably that, too, will be symmetrical, in which case the ratio will not be seriously affected.

3. The relation between the loudness of the heart-sounds and the condition of the heart-muscle is based upon experience. To this I shall refer shortly, results,* perhaps, are the best reply to this criticism.

4. If we were to attach importance only to observations in which all factors were known, we should attach importance to none. We attach importance to the temperature of a patient, but we know very few of the factors which govern this. We attach importance to the presence of albumen in the urine, to blood-pressure, to heart-frequency and innumerable observations of a like nature, of the governing factors of which we are profoundly ignorant.

5. The examination of the myocardium can be carried

---

* *Vide* O. Leyton, *Lancet*, February 5, 1916. S. Ramsay, *Brit. Med. Journ.*, October 1916, p. 521. A. Abrahams, *Lancet*, March, 1917, p. 444.

out by measuring the alteration in electric potential at different points during the heart-beat. The instrument required is delicate, but not very portable; the patient should be brought to the instrument, and not the instrument to the patient; probably the electric method is better than the differential stethoscope. Opportunity to compare has not offered, but I hope to investigate that matter soon.

The sphygmograph may demonstrate a pulsus alternans, which is said to point towards myocardial degeneration. I have seen cases of advanced myocardial degeneration, in which there was no pulsus alternans within a comparatively short time before dissolution.

A gradually falling blood-pressure in an aged person is very suggestive of myocardial degeneration, but this method requires several observations spread over months or even years.

Perhaps I ought to add that many of these criticisms have been offered by men who have never used the instrument even in the cruder form.

The differential stethoscope allows one to determine the relative intensities of a series of sounds; the next question which arises is the evidence upon which the conclusions based upon these intensities rest.

The first point of interest is the remarkable constancy of the ratio of the first sound at the apex to the second sound at the base, this is 2 : 1 in the healthy man, the sounds being measured whilst the patient is standing. The instrument is of no value when there are murmurs which obscure the sounds.

A short time ago I asked a medical friend, whether he had formed any opinion about the value of the differential stethoscope. He replied that he had not made up his mind yet, but that he had been prevented from making a serious error in prognosis by its aid; that he had examined a man and failed to find any evidence of disease except that the second sound of the heart, according to the differential stethoscope, was louder than the first sound; the patient died quite suddenly six weeks after the examination.

A similar experience came my way, a number of years ago, in a man of little over fifty who complained of indefinite symptoms. The second sound of his heart was double that of the first sound. I told his daughter that I took a serious view of her father, and that the end might come at any moment. Three months later the man died suddenly whilst at his desk in his office.

Often opportunity is offered, which allows one to watch the gradual alteration in the heart muscle as age advances, and often, *pari passu*, a fall in blood-pressure accompanied by an increasing debility.

The gradual approach to unity of the ratio of the heart sounds and then the aortic second becoming louder than the apical first, later œdema of legs and then of lungs is only evidence of the accuracy of the instrument and not of its utility. The cases of influenza, scarlet fever, diphtheria, and other infections with the ratio of the heart sounds becoming unity, and as recovery occurs returning to 2 : 1, are so numerous that any record of the cases would be tedious.

After more than ten years' use of the differential stethoscope, I have come to the conclusion that, when the ratio of the intensity of the first sound at the apex to the second sound at base is less than 1·5 : 1, there is usually considerable alteration in the heart-muscle, and rest is indicated. This alteration need not be of a permanent character, and in young people frequently is due to a temporary toxæmia.

◆

RECENT WORK IN NERVOUS DISEASES.

By H. CAMPBELL THOMSON, M.D., F.R.C.P.

Physician to the Department for Nervous Diseases, Middlesex Hospital;
Physician to the Hospital for Epilepsy and Paralysis,
Maida Vale, etc.

APHASIA IN RELATION TO MENTAL DISEASE.

"APHASIA in Relation to Mental Disease" was the subject chosen by Dr. R. Percy Smith for his presidential address, delivered at the Section of Neurology in October, 1917.[1] After referring more particularly to the writings of Hughlings Jackson, who showed so clearly that the phenomena of speech are primarily psychical, and only in the second place susceptible of physiological or anatomical explanation, Dr. Percy Smith states that, in cases of aphasia, the alienist may be called in to consultation for the following reasons:—

1. Because of the confused or incomprehensible speech of the patient and other conduct suggesting confusion or disorder of mind, the nature of the speech affection being misunderstood by his relatives and not always recognized by the practitioner.
2. Because of definite signs of mental disorder predominating over the aphasic speech troubles. Previous attacks of insanity may have occurred and been recovered from, and the attack of aphasia may occur in association with a return of the previous symptoms or be masked by loss of memory, mental confusion, or apraxia.
3. To decide on the proper care and treatment of patients in whom aphasia of various degrees of severity is associated with disorder of mind and conduct.
4. To assist in forming a prognosis as to mental recovery or otherwise, or in the diagnosis from other organic conditions, such as general paralysis.
5. To give an opinion as to the business or testamentary capacity of a patient suffering from aphasia, or occasionally to assist in the solution of the question

of responsibility of an aphasic in criminal cases.

6. Occasionally, one is consulted by a patient, with manifest aphasia, about his or her own mental condition, why there is difficulty in writing letters and getting "command of words," and what is the outlook for the future.

Dr. Percy Smith gives statistical particulars of forty-five cases of aphasia associated with mental disorder, which have come under his notice, as regards the condition of heart, vessels, and kidneys, the presence or absence of definite hemiplegia, and also as to heredity, previous attacks of insanity, and the history of syphilis or alcohol, and gives cases to illustrate the different examples.

In the final part of his address, the very important subject of testamentary capacity in cases of aphasia, is dealt with, and Dr. Percy Smith quotes the general principles which underlie the decision in such cases, and which should be always remembered, namely, "That the testator shall understand the nature of the act and its effects; shall understand the extent of the property of which he is disposing; shall be able to comprehend and appreciate the claims to which he ought to give effect; and, with a view to the latter object, that no disorder of the mind shall poison his affections, pervert his sense of right, or prevent the exercise of his natural faculties, that no insane delusions shall influence his will in disposing of his property, and bring about a disposal of it, which, if the mind had been sound, should not have been made."

Reference is made to the statement laid down by Hughlings Jackson that the question "Can an aphasic make a will?" cannot possibly be answered in general terms, and that it should be put in the form, "Can this or that aphasic person make a will?"; *i.e.*, every case must be considered on its merits after a careful examination on the lines indicated above.

THE INTERPRETATION OF THE NEUROSES.

"The Interpretation of the Neuroses" was the subject dealt with by Dr. Dercum in an address read before the Philadelphia Neurological Society.[2] Dr. Dercum alludes to the fact, that in recent times there have been writers who have maintained that classification of the neuroses is neither possible nor necessary, a view which Dr. Dercum strongly opposes.

He first of all proceeds to give some account of the general physiological manifestations of fatigue, and then proceeds to make a classification of the neuroses, which should certainly prove useful as a working basis, even though the limits of the different classes cannot always be sharply defined.

Neurasthenia.—Neurasthenia is regarded as a genuine fatigue-neurosis, of which the principal sign is the readiness with which the patient becomes exhausted, whether mentally or physically; there is also a diminished inhibition of tendon reflexes, which frequently results in their exaggeration. On the mental side, there is diminished capacity for sustained work with a difficulty in maintaining the attention and concentration, together with increased susceptibility and easily disturbed emotions. Such a patient loses some of his will power, defers the decision of difficult matters, and looks at things with a disordered perspective; on such an exhausted nervous system, morbid fears are often engrafted. Dercum considers that neurasthenia on these lines presents itself as a well-defined syndrome, in which the essential and underlying factors are always those of chronic exhaustion and persistent fatigue, and the symptoms which he thus outlines are those of an exhaustion affecting an otherwise normal organism. To this condition he applies and limits the term "neurasthenia simplex."

Psychasthenia.—When a patient, who has previously been of neuropathic disposition, becomes exhausted, further symptoms are developed, the prominence of which may dominate the picture to such an extent that the factor of the nervous exhaustion may be lost sight of. The general symptoms resemble those of simple neurasthenia, on the top of which the patient becomes hesitating, irresolute, timid, and fearful; he feels he can do nothing like other people, and this feeling of inadequacy usually becomes worse if the task is new or the patient is in the presence of strangers. The will-power is impaired, and there is uncertainty and doubt. Hesitation and lack of decision may develop into a *folie de doute*, and phobias, obsessions, or anxieties may follow.

If a patient who is suffering from simple neurasthenia, *i.e.*, if he has not been previously neuropathic, has an attack of generalized fear, the attack passes off without any after-effects, but if the patient is neuropathic, a pathological association may be formed in his mind, so that the emotion of fear becomes definitely linked to certain relations of the environment. Thus, a patient happens to have a spontaneous attack of fear whilst alone, when immediately there is formed in his mind an association between the attack of fear and the fact of being alone, and a monophobia results.

Hysteria.—Hysteria is characterized by the ease with which the patient accepts suggestion, other factors being exaggeration of emotional reaction and expression, together with general emotional excitability, the hysterical person reacting inordinately to fright, joy, anger, disappointment, etc. Hysteria is thus defined as an innate neuropathy, the essential factors of which are feebleness of resistance to mental impressions and emotional instability; in other words, there is undue vulnerability to suggestion and exaggerated emotional reactions. Hysteria is also a neuropathy of degeneracy, and hysterical patients, with few exceptions, do not become efficient members of the general community in the ordinary affairs of life.

Hypochondria.—In hypochondria, the symptoms owe their origin to a change in the general sense of bodily well-being, which change causes a more or less fixed conviction of illness. The patient feels he is not well, and this feeling may be so strong as to dominate for the time being his life and actions. He usually seeks an explanation of his feelings by referring them to disease of one or more organs, but a careful clinical examination fails to reveal anything abnormal. Hypochondria can occur without the presence of a single symptom of the fatigue-neurosis or of a single hysterical stigma; it can occur independently of melancholia or other demented states, and is the expression of an abnormal condition inherent in the individual.

Neurasthenia Symptomatica.—This is the term Dercum applies to neurasthenic symptoms which may accompany visceral disease. Serious bodily disease naturally weakens the entire organism, and it is natural that various signs should be present in the nervous system; he states, however, that these symptoms are never those of the fatigue-neurosis of simple neurasthenia.

Dercum claims that the foregoing consideration of the neuroses leads to a simple and natural classification, which was largely anticipated by Robert Whytt over a century and a half ago. The neuroses thus arrange themselves into neurasthenia, psychasthenia, hysteria, and hypochondria. Neurasthenia is the result of exhaustion, psychasthenia of exhaustion occurring in a neuropathic subject, while hysteria and hypochondria are both innate neuropathies, each defined by its own special characteristics.

SYMPTOMATOLOGY OF THE NERVOUS SYSTEM IN CHRONIC INTESTINAL TOXÆMIA.

Dr. G. Reese Satterlee and Dr. Watson W. Eldridge[3] consider that chronic gastro-intestinal conditions are the cause of severe neurasthenic disturbance. For the purposes of simplification they classify disorders of the nervous system, associated with intestinal toxæmia, into four classes according to whether (i) the mental system, (ii) the sensory system, (iii) the motor system, (iv) the sympathetic system, is involved; though they acknowledge, as one would expect, that in most cases more than one system is affected at the same time. They lay stress on the fact that, in a large number of their cases, the nervous symptoms have disappeared or improved after treatment directed towards the intestinal toxæmia.

As the result of the study of 518 cases for the purposes of their paper, the conclusions arrived at are: (1) that the nervous system is nearly always affected to some extent by chronic intestinal toxæmia, and that the nervous symptoms are often the most prominent in the case; (2) that the gastro-intestinal tract should be thoroughly investigated in cases of chronic symptoms of the nervous system in which other causes can be excluded; (3) that disturbances of the gastro-intestinal system are more often the cause than the result of nervous disorders; (4) in doubtful cases, the result of treatment of the intestinal tract is often the deciding factor in differential diagnosis.

THE PROGNOSIS IN DISSEMINATED SCLEROSIS.

Dr. Byrom Bramwell has written a paper on the "Prognosis in Disseminated Sclerosis"[4] based on the study of 200 cases. Dr. Bramwell dwells on the usual deceptive nature of the improvements, which unfortunately are generally temporary; in very rare cases only is the improvement so prolonged as to warrant the belief that a permanent arrest or cure has taken place.

Dr. Bramwell believes, in common with many others, that the patches of sclerosis are due to irritation of toxins, the recurrence and remission of symptoms being very suggestive of repeated intoxications. Such toxins, if they exist, are probably produced within the body, for it seems difficult to suppose that fresh doses would be introduced again and again from without over a long period of years. If the exacerbations and relapses are thus due to recurring intoxications, it is not unreasonable to suppose that in some cases the intoxication will cease, and that a permanent arrest of the disease may take place.

In those rare cases in which the symptoms completely disappear, and arrest of the disease seems to take place, optic atrophy and Babinski's sign, if present, will remain and are to be regarded as results rather than active manifestations of the disease. In order to try and determine the duration of the disease, and so to arrive at one of the data for a satisfactory prognosis, Dr. Bramwell has analysed the results in 200 of the cases which have come under his observation in hospital and private practice. Of 200 cases analysed, there were 106 deaths, 64 were known to be still alive, and in 30 the result was not known. Of the 64 which were known to be still alive, 42 were much worse, 12 remained stationary, 7 were greatly improved, and 3 quite well. The date of onset of the disease was definitely ascertained in 170 cases, and the average duration of the disease in these cases, up to October, 1916, was 12 years and 1 month. In one case the disease had lasted 37 years, and in 14 cases for more than 25 years. An analysis of the 106 fatal cases shows that in 21·6 per cent. instances the disease terminated in less than five years; in 50·9 per cent. in less than ten years; in 73·5 per cent. in less than 15 years; and in 86·7 per cent in less than 20 years.

Dr. Bramwell gives clinical records of two cases in which a permanent cure appears to have occurred, and in two cases in which the disease lasted respectively for 37 and 34 years.

ACUTE POLIOMYELITIS.[6]

The epidemic of Poliomyelitis, which occurred in the United States in 1916, enabled some important conclusions to be arrived at with regard to the spread of the disease. Dr. Henry L. K. Shaw, writing in the *Journal of the American Medical Association,* July 21, 1917, gives some interesting information on these points. He states that it seems clear that the incubation period of the disease is from three to ten days, and that if a child that has been exposed to the infection does not develop symptoms within two weeks, it can be considered safe. Another most important point is the length of time in which a patient, having had poliomyelitis, may transmit the disease to others. For the investigation of this point it was necessary to include only those instances in which the date of onset of the primary case was positively established, and a definite date when the secondary case was exposed. The number of cases in which these particulars were obtained was necessarily small, for in most instances a strict quarantine was enforced as soon as the case was diagnosed, so that the number of exposures was limited. From careful analysis of data thus obtained, Dr. Shaw states: "It would seem that the longest period a primary case was actually observed to be infectious, was eight days, and in most cases it was one or two days." The conclusion Dr. Shaw draws is, that a period of quarantine of three weeks gives ample and sufficient protection.

The evidence that poliomyelitis is transmitted by contact also appears to be very clear, and Dr. Shaw concludes his paper by stating that from investigations in this recent epidemic, it is clear that poliomyelitis is transmitted by contact with a patient or a carrier; that the period of incubation averages seven days; and that three weeks is a sufficient period to keep a patient with poliomyelitis in quarantine.

REFERENCES.

[1] *Proceedings of the Royal Society of Medicine.*

[2] *The Journal of the American Medical Association,* April 28, 1917. Vol. LXVIII., No. 17.

[3] *The Journal of the American Medical Association,* October 27, 1917. Vol. LXIX., No. 17.

[4] *Edinburgh Medical Journal,* January, 1917, Vol. XVIII., No. 1.

[5] *The Journal of the American Medical Association,* July 21, 1917

◆

A RETROSPECT OF OTOLOGY, 1917.

By MACLEOD YEARSLEY, F.R.C.S.

Late Senior Surgeon, Royal Ear Hospital, etc.

THE greater part of the work published during the year has been devoted, as in the two previous years, to war injuries and affections. It is hardly possible to do more than single out a few of these papers as specially noteworthy from the mass of literature, which the past three years have given to the profession on this subject.

Foremost may be noted "The Morbid Anatomy of War Injuries of the Ear," by J. S. Fraser and Captain John Fraser (*Journ. of Laryng.*, XXXII., 340). This is a systematic paper of great value to those interested in this subject. It classifies these injuries into (1) Direct injuries (bullets, etc.); (2) Indirect injuries (blows or falls on head), subdivided into (*a*) without labyrinthine fracture, (*b*) with fracture of the labyrinthine capsule; (3) Noise deafness, due to prolonged or intense gunfire; and (4) "Shell" or "explosion" deafness (labyrinth concussion). Hysterical deafness or deaf-mutism and malingered deafness are not included. These four groups are discussed fairly exhaustively, with the help of excellent micro-photographs from actual specimens.

A useful short paper is "Prevalence of Ear Injuries and Diseases in the French Army," by Major Sohier Bryant (*Journ. of Laryng.*, XXXII., 338), from which it appears that the total sick in the Zone des Armées at the Front contains 16 per cent. of ear cases; 4½ per cent. of these are evacuated to the rear. In the rear of the zone, ear cases form 6¼ per cent. of total sick. The author estimates that about 80 per cent. of the ear cases will show considerable impairment of function, sufficient to interfere permanently with civil occupation.

Captain H. J. Marriage contributed a paper on "War Injuries and Neuroses of Otological Interest," as President of the Section of Otology, Royal Soc. of Med. (*Journ. of Laryng.*, XXXII., 177), in which he dealt with various cases. His remarks upon obturators are valuable. He considers they are of distinct benefit in saving the hearing, and that one of the simplest and best forms is plasticine wrapped in gauze; easily moulded to the meatus, inserted, and withdrawn. He prefers this to the Mallock-Armstrong plug. Plugs made of celluloid are dangerous, for ears have been damaged by these obturators being set on fire by the flash of a shell.

In the *Revue de Laryngologie,* for April, 1917, appeared a valuable paper by Moure and Pietri on "The Organ of Hearing in War." The article is long, but the following points are especially worthy of note. Functional tests enable us to decide between an affection of the cochlea, or vestibule, or both. If there is disagreement between the various tests, the factor of exaggeration may be responsible. The literature gives no idea of any symptom-complex characteristic of auditory psychoses, but the authors find the "cerebral" patient shows an hebetude, apathy, indifference to his surroundings, disinclination to be questioned, or to assist the expert in examining him. The truly deaf man tries to listen, tries to lip-read. In contrast to these, the exaggerator shows a striking discrepancy in hearing-tests when these are repeated several times, avoids the expert's eye, and shows self-consciousness to personal remarks.

A man who is truly deaf and has learned to lip-read, can do so equally well with a noise-apparatus working in his ear, whereas the malingerer appears to lip-read, but is helpless when the noise-apparatus is applied.

A paper, which should be of considerable practical value to those who have to examine for physical fitness for the Army, appeared in the *Medical Press and Circular* for September 19, 1917, from the pen of Captain J. C. McWalter. It deals with the physical conditions which unfit a man to be a flying officer. The author says that among those young officers who have been passed into the Flying Corps, but who have been unable to pass the necessary test in the prescribed time, he has almost invariably found some trouble of the nose, throat, or ear. Rhinitis is a very common ailment, and "it seems probable that when the Eustachian tube is unhealthy, and when the patient is exposed to air currents of varying density, that the semi-circular cells (*sic*) must become affected." He cites cases in proof of his contention, and concludes thus: "To ascertain the type of man, or the type of abnormality or disease, which makes such a man so much the victim of his nerves that he is gripped with fright, like a hare on which an eagle swoops, that he cannot co-ordinate his faculties to wrest himself from destruction. Training clearly can do much, but certain physical imperfections of the nose, throat, ears, Eustachian tube, and semicircular canals seem to me to be most often associated with the man who gets gripped with air fear. Some of us are so particularly prone to become obsessed with views as to the importance of certain abnormalities, that it becomes difficult to take a detailed view, but I do not remember a man who was considered an unsuccessful flyer but in whom some such an abnormality could be demonstrated."

Lastly, connected with the war, is the publication (*Journ. of Laryng.*, XXXII., 273), by Macleod Yearsley, of "An Air Raid Case." This was a school teacher, aged 27, who was standing by the front door of a school, superintending the passing of her class to the basement, when a bomb exploded in the street. She was thrown down, sustained a scalp wound, and was made deaf with tinnitus, but experienced no vertigo. The cause of the deafness appeared to be the depression of the tympanic membrane by the explosion, and she recovered completely after about four to six weeks' treatment by inflation.

Of papers upon otological subjects not connected with the war, the following appear to be the most worthy of mention.

"Hearing Tests from a Practical Standpoint," by G. L. Richards (*Boston Med. and Surg. Journ.*, CLXXVII., 213). In this paper, hearing tests are not discussed in detail. The author considers they take up too much time. He prefers in all ordinary cases merely to determine the quantity and quality of the deafness present, and the situation of such lesions as far as tests can enlighten him. He uses tuning forks for Rinne test and bone conduction, takes low and high tone limits, and the voice test. He commends the use of the Bárány noise apparatus. He points out the difficulties attendant upon testing children, and that many of them cannot be tested accurately until the third or fourth year in school.

Macleod Yearsley (*Journ. of Laryng.*, XXXII., 117), published a long paper on "The Causation and Prevention of Educational Deafness," with the intention of bringing to the notice of otologists the fact that they have hitherto paid far too little attention to the prevention of deafness, a question in which the whole future of otology must be bound up, if it is to keep its place as a progressive branch of medicine and surgery. By "educational deafness" is meant, the degree of loss of hearing which prevents a child from obtaining the full benefit of ordinary education in an elementary school, and necessitates his being taught in a special deaf school or "hard of hearing" centre. The arrangements for the education of the deaf under the London County Council are described, for most specialists seem to be almost entirely ignorant upon this important subject. Special attention is drawn to the "hard of hearing" schools, which owe their origin to this author's initiative. As regards prevention, suggestions, necessarily generalized, are made as to deaf birth, but in dealing with acquired deafness, the necessity for research into the genesis of ear complications in the exanthemata and into meningitis is emphasized, as well as that it cannot be realized too strongly that the beginnings of primary ear disease must be sought and treated in the pre-school age.

In conclusion, it should be noted that the past year has seen the publication of Albert A. Gray's work on *Otosclerosis* (Idiopathic Degenerative Deafness), one of the finest original works of modern otological literature.

In the matter of tonsils and adenoids, which bear so closely upon otology as to be justifiably included in any retrospect thereon, readers are specially enjoined to turn to THE PRACTITIONER, XCIX., p. 109, and to read the very excellent and common-sense paper by Dan McKenzie, entitled "Some Hints on the Tonsil-Adenoid Operation based on the Experience of 5,000 Cases."

CARCINOMATOUS OR SARCOMATOUS PERICARDITIS, WITH A NOTE ON ANALOGOUS DIFFUSE CARCINOMATOUS OR SARCOMATOUS INFLAMMATION OF OTHER SEROUS MEMBRANES (PERITONITIS CARCINOMATOSA, ETC.).

BY F. PARKES WEBER, M.A., M.D., F.R.C.P.

THERE exists a group of cases in which the surface of a serous membrane becomes diffusely infiltrated with carcinoma or sarcoma (the situation of the primary growth is not always obvious) and in which there are inflammatory changes superadded, with small-cell infiltration and diffuse formation of new thin-walled blood-vessels. Owing to the fragility of the newly formed capillaries a certain amount of hæmorrhage frequently takes place, with the result that the serous effusions in such cases are often more or less mixed with blood (sero-sanguineous).

Amongst cases of this kind one may instance those of so-called "peritonitis carcinomatosa" (which are, perhaps, the most characteristic of any), "pleuritis carcinomatosa," "pachymeningitis carcinomatosa," "leptomeningitis carcinomatosa," and "leptomeningitis sarcomatosa." The following is, apparently, an analogous case of what one might term "pericarditis carcinomatosa."

The patient, R. J., a married woman, aged 68 years, was admitted to hospital on August 25, 1917. She was rather fat, and flabby in appearance, and gave a history of having been ailing, since an "influenzal" attack in the spring of 1917, with bronchitic symptoms. In the hospital there was no fever, but there was a condition of great weakness, with dyspnœic collapse on the slightest exertion. There was much crepitation at the base of the left lung, with a little mucous slightly "rusty-looking" (or on one occasion, slightly reddish) sputum. The feet and lower parts of the legs were a little œdematous. The pulse varied between 88 and 118, and the respiration between 32 and 48, per minute. The brachial systolic blood-pressure was 165 mm. Hg. The urine was passed in fair quantity and was of specific gravity 1022–1025, of acid reaction, and free from albumen and sugar. The patient was treated on the supposition that the state of the left lung was due to the remnant of an influenzal pneumonia, and the local physical signs seemed to diminish, though the general condition did not improve. On September 6, 12 days after admission, severe collapse occurred, and she died in about 10 minutes.

NECROPSY AND MICROSCOPICAL EXAMINATION.

The pericardium was distended with about a litre of a mixture of serous fluid and fluid blood (no clot). A large part of the heart (epicardium) had the appearance of pericarditis combined with a diffuse, superficial, warty, neoplastic growth. In the upper part of the parietal pericardium, about the root of the great vessels, there were also " warty " growths; there was a similar tumour-formation in the pleuro-pericardial region of the right pleura, as if the new-growth had " grown through " from pericardium to pleura—a supposition which was strengthened later on by the result of microscopic examination. There were two cherry-sized nodules of tumour in the right lung. The heart was somewhat enlarged, weighing 15 ounces, but was free from valvular disease. The " warty " condition of the surface of the heart appeared, by microscopical examination, to be carcinomatous. The subepicardial fatty layer contained alveolar infiltrates of apparently carcinomatous cells, and the surface of the pericardium showed inflammatory small cells and evidence of pericarditis. There was neither complete nor partial rupture of the myocardium. The pericardial hæmorrhage must have been derived from the thin-walled newly-formed capillaries, connected with the condition of " pericarditis carcinomatosa."

Some of the bronchial lymphatic glands and some lymphatic glands in the abdomen, near the pancreas, were infiltrated with the new growth. The nodules in the right lung (mentioned above) were proved by microscopic examination to be of the same tumour structure. Where the primary growth was, remained uncertain. No distinct lumina could be seen in the tumour alveoli. There is, I suppose, a possible alternative to the pathological diagnosis of carcinoma, namely, that the new-growth is to be regarded as an alveolar endotheliomatous sarcoma, originating from the serous lining of the pericardium—in other words, a primary endothelioma of the pericardium.

A subcutaneous chestnut-sized nodule, which I had felt during life close to, but distinct from, the lower inner border of the left mamma, was found after death to be hard and partially calcified, and by microscopical examination appeared to be a degenerated fibroma. There was likewise a little, pea-sized, white nodule on the outer surface of the stomach, which microscopically showed a fibrous structure. I am indebted to Dr. H. Schmidt for much help in regard to the pathological examination of the case.

ANALOGOUS DIFFUSE CARCINOMATOUS INFLAMMATORY CHANGES OF OTHER SEROUS MEMBRANES.

In regard to peritoneal carcinoma of the type of "peritonitis carcinomatosa," I can shortly describe the following case, through the kindness of my surgical colleague, Mr. A. Compton. The patient, a woman, aged 48 years, died in hospital (January 1917) after a short illness accompanied by ascites, but without jaundice. The necropsy and microscopical examination showed the peritoneal surface of the intestines, mesentery, and omentum to be diffusely infiltrated with the carcinoma. This process was accompanied by much inflammatory small-cell infiltration. At one part of the parietal peritoneum there were very definite, newly formed blood-vessels to be seen with the naked eye on the surface. In another case, I may here state, I have been able easily with my finger to scrape away the newly formed blood-vessels from the original peritoneal surface, over which they had developed; and in this case I could probably have done the same if I had tried. The outer walls of the intestines were thickened, hardened, and somewhat contracted, and the great omentum and mesentery were also hardened and contracted. There was not, however, a so-called "leather-bottle stomach," such as is not rarely met with in cases of diffuse peritoneal carcinomatosis.[1] The primary carcinoma was at the neck of the gall-bladder, and it was associated, as carcinoma of the gall-bladder often is, with cholelithiasis.

I will not stop to describe analogous cases of "pleuritis carcinomatosa," and, in regard to "pachymeningitis carcinomatosa," I will refer to a case that I recently described in the *Clinical Journal*.[2] The patient, Mrs. M. B., was a woman, aged 57 years, who died in March, 1916, from diffusely disseminated carcinomatosis. On the last day of life she was more or less comatose, and had recurrent epileptiform convulsions, some of which were more evident on the right side of the body than on the left. After death, nothing special was noted in the brain itself, but there was a condition of the cranial dura mater which at first (by naked eye examination) I supposed to be one of chronic internal pachymeningitis. Subsequent microscopical examination, however, proved it to be the result of diffuse carcinomatosis of the dura mater. The internal aspect of the membrane was specially involved, and the inflammatory reaction accompanying this carcinomatosis constituted a condition which might be termed "cancerous pachymeningitis" or "pachymeningitis carcinomatosa."

In regard to "leptomeningitis carcinomatosa" there are relatively recent accounts by E. Schwarz (1910), Meyer (1911), and S. Maas (1913). In the case described by Maas the patient developed psychical symptoms resembling those of so-called "Korsakoff's disease." In regard to "leptomeningitis sarcomatosa," or, as Rindfleisch[3] termed it, "meningitis sarcomatosa," I would refer to the papers by S. Coupland and W. Pasteur,[4] A. S. Grünbaum,[5] and L. Parsons.[6]

REFERENCES.

[1] *cf.* Nuthall, A. W., and Emanuel, J. G.: *Lancet*, London, 1903 Vol. I., p. 159. In all their three cases there was a so-called "leather-bottle" condition of the whole or part of the stomach.

[2] Weber, F. P.: *Clinical Journal*, London, 1917, Vol. XLVI., p. 114.

[3] Rindfleisch: *Deut. Zeitschr. f. Nervenheilk.*, 1904, Vol. XXVI., p. 135.

[4] Coupland and Pasteur: *Trans. Path. Soc. of London*, 1887, Vol. XXXVIII., p. 26.

[5] Grünbaum: *Ibid.*, 1906, Vol. LVII., p. 313.

[6] Parsons: "Diffuse Sarcomatosis of the Brain and Spinal Cord," *Proc. Roy. Soc. Med., Section for the Study of Disease in Children*, 1913, Vol. VI., p. 168. This is a subject somewhat different from that of "Leptomeningitis sarcomatosa." *Cf.* also H. Kaiser, Ziegler's *Beiträge z. path. Anat. u. z. Allg. Path.*, Jena, 1916, Vol. LXII., p. 265.

THE PLACE AND FUNCTION OF CARBOHYDRATES, PROTEINS, AND FATS IN THE DIET.

By DAVID CURLE, M.D., C.M.

Glasgow.

How to obtain the maximum of health and strength from a minimum expenditure on food is, at the present time, a problem of national importance, owing to the urgent demand for muscular energy on the one hand, and the shortage of essential articles of diet on the other. As a problem, it largely resolves itself into the question, " How far can the low-priced carbohydrates safely fill the place of the high-priced proteins and fats? "

On this point, rare opportunities occur almost daily if, before examining a specimen of urine, we ascertain from the patient the diet and conditions of living which preceded its excretion. In the past, the presence of unassimilated sugars in the urine has excited very little interest, or been altogether ignored, unless when glucose was present in sufficient quantity to arouse suspicions of diabetes mellitus. This has largely been due to the small proportion of sugars usually found in the urine, and the difficulties involved in its detection. The presence of 2½, 3, or 4 parts of sugar in 1,000 of urine, when 1 to 1½ are recognized as normal, may seem a very trivial event. If only a passing event, it may be dismissed as trivial, but if repeated examinations reveal the continued presence of the former amount, clinical observation and further consideration of the conditions under which such a small increase is maintained will demonstrate that even this trivial symptom is an important one, in so far as the health, comfort, and happiness of the patient are concerned.

In our study of these conditions, let us first consider the behaviour of the body into which these sugars have been admitted. The two outstanding points are its tendency to conserve, or hold up, all sugars admitted into it, and its tendency to prevent any rise over the normal proportion of these in the circulating blood. This prevention of increase in the proportion of sugar is conceivably an act of defence, on the part of the body, to prevent damage to the blood corpuscles from any increase in the osmotic energy of the serum.

In the solution of the problem as to how the osmotic equilibrium is maintained, modern experimental physiology has thrown valuable light. When sugar is introduced into the blood in abnormal quantities, first a large volume of low specific gravity fluid is drawn from the tissue-spaces into the vascular system, and then the sugar, and, finally, the excess of fluid, passes into the tissue-spaces, whereby the amount of sugar in the blood is diminished and the osmotic equilibrium restored. The hypothesis suggested by Mr. Leonard Hill affords a rational explanation of the process. " The introduction of the sugar increases the osmotic energy of the blood above that of the tissues, and draws water into the vascular system. The capillaries are better filled, and the surface energy of the tissue-spaces is increased in proportion as the surface tension is increased in the capillaries. Sugar passes through the permeable film formed by the capillary wall into the tissue-spaces and cells, and thus the osmotic pressure of the blood falls. Surface energy then gets the upper hand, and water passes from the distended capillaries into the tissue spaces. This occurs particularly in the highly vascularised abdominal organs where the flow of lymph is furthered by the respiratory pump."[1]

From these observations, it is apparent that when, day by day, an excess of sugar, above what can be assimilated or stored, is introduced into the blood, a point must be reached when the osmotic equilibrium can no longer be maintained on account of the intercellular fluids becoming surcharged with sugar. When this point has been reached each increment must go to increase the proportion of sugar in the blood, until the ratio is reached of 2 or more per 1,000, and alimentary glycosuria is initiated, and maintained.

The term glycosuria used in this condition is an unfortunate one, for clinical observation demonstrates that mixed sugars are the rule, and, also, because the term glycosuria is so often used as the synonym of diabetes mellitus. In the remainder of this paper, I shall, therefore, use the term carbohydruria to indicate what has been hitherto known as alimentary glycosuria, a disorder, or, rather, a symptom of a disorder, which underlies a large number of the ills of life, but disappears under rational treatment. In rectifying these ills, the first consideration is to detect the presence of carbohydruria, to estimate the amount, and so compare the condition of progress in the patient from time to time.

It is important that our test must be as simple and as rapid as possible. It must indicate the presence of any unassimilated carbohydrate or protein with a carbohydrate radical, and must also clearly indicate the number of parts per 1,000. For the purpose, Molisch's test would be a suitable one, but unfortunately, it does not lend itself to quantitative estimation. As a quantitative test, therefore, I substituted, about four years ago, the following one, based on the property which strong sulphuric acid possesses of abstracting the elements of water from carbohydrates, and, thereby, liberating the carbon. This carbon is partly liberated, in solutions, in the form of dark caramel, and partly in the form of a black powder, so fine that a single grain blackens over 70,000 grains of water (one gallon). For urine examination, the reagent is specially well suited, for it has no action on urea and its compounds, and so leaves their carbon undisturbed.

The test is carried out as follows. To obviate damage to graduated measures by the heat produced in the reaction, a test tube, A, 5 in. by $\frac{3}{4}$ in., is selected, and in it is nested a test tube, B, 6 in. by $\frac{5}{8}$ in. With B pushed to the bottom of A, marks are made with a file on A (the outer tube) at the points where 4 cc. and 8 cc. respectively reach when these quantities of fluid are poured into the inner tube B. B being an inch taller than A, allows it to be gripped for withdrawal. In testing, acid. sulphuric. fort., P.B. is placed in the inner tube up to the 4 cc. mark on A, and urine floated over it to the mark 8 cc. B is then withdrawn from A, held against transmitted light, and the reaction at the line of union of acid and urine observed. Dextrose, maltose, and lactose give no colour until the fluids are mixed. If a yellow line forms, cane or beet sugar is present. If a brown colour forms slowly, lævulose is present.

Now mix the fluids until no sulphuric acid remains at the bottom, by slowly shaking the tube, and, with the mouth of the tube pointing in a safe direction, pass it through an open flame until its contents cease to blacken on boiling. If the resultant colour is only a little darker than brandy, the specimen is normal, or about 1 per 1,000 of mixed sugars. If totally black and opaque, it contains about 3 per 1,000 or over. Next, cool the contents of the tube by passing it through a stream of cold water, replace in tube A, and add water to 8 cc. mark, to make up what has been lost by evaporation, and the product is ready for colorimetric estimation. In acting on dry sugars with sulphuric acid, some carbon is lost as CO_2. In urine testing, no CO_2 can be detected when the vapours are passed through lime water.

For colorimetric estimation, two 5 cc. graduated stoppered jars (with foot), as used for test mixing, are necessary. They must be of the same calibre. In one, A, is placed 1 cc. of the prepared urine, after shaking. In B is kept the standard solution reaching to the top. Water is then dropped into A and shaken on each addition, until the colours match. The whole process may be got over in 1½ minutes, and so far my only accident has been the cracking of an outer tube by inadvertently passing both tubes through the flame. When the colour of the urine matches the colour in the standard jar, the figure in the trial jar indicates the amount of carbohydrates present in the specimen under observation, as compared with the standard. *E.g.*, if 3 cc. three times normal, or 3 per 1,000, etc.

In taking up the study, my first difficulty was to find a standard for comparison, and the first was obtained from a healthy infant, fed solely at the breast of a healthy mother, in a well-ventilated home. Subsequently, after patients had been dieted for a length of time, corresponding specimens were obtained, and one or two specimens were obtained from patients who were very careful feeders, using no cane sugar in the diet, and living chiefly in the open air, or well-appointed homes. All agree in being just a very little darker than brandy, and for the beginner a specimen of urine which gives a darker reaction than this may be diluted with proof spirit to bring it to this colour. The specimen is darker than that obtained by dehydrating a 1 per 1,000 solution of sugar, owing to the presence in the urine of infinitesimal quantities of substances which are slightly darkened by sulphuric acid, but are common to all urines, and do not appreciably alter the results. Nor is the result appreciably vitiated by the amounts of acetone, creatinin, or hippuric acid usually present in the urine.

If desirable, however, creatinin, glycuronic acid, salicylic compounds, chloral, or chloroform, should they be present, can be removed before testing by filtering the urine two or three times through animal charcoal. All drugs, however, should be stopped before taking the specimen. (List of drugs which are blackened by sulphuric acid.[2]) The sample of urine selected should either be the average of 24 hours' excretion, or, where this is impracticable, the first passed in the morning. Urines of low specific gravity, such as are passed after excessive drinking, or in diabetes insipidus or hysteria, are useless for our purpose, as are, also, the dark urines passed after excessive sweating, or from cases of jaundice or melanotic sarcoma. Even a light coloured urine, however, from a chlorotic patient, frequently gives quite a good reaction.

Of course, in every case, before testing for carbohydrates, the usual routine examination of the urine should be gone through, as, also, confirmative tests for individual sugars occasionally, the details of which are beyond the scope of this paper.

When in such examinations calcium compounds are present in quantity, in particular calcium supercarbonate, the action of sulphuric acid on carbohydrates is diminished or prevented so that estimations are not trustworthy.

When more than 5 per 1,000 of sugars are found to get accurate results, the urine should be diluted with water, and the product multiplied by the dilution number.

For the purpose of interpreting results of urine examination, let us consider the known causes of carbohydruria.

Occasional causes are cerebral tumour, cerebral hemorrhage, meningitis, and, sometimes, pancreatitis. It is very common after injuries to the head, and a passing carbohydruria frequently follows cerebral concussion. It usually follows prolonged anæsthesia, alcoholic excess, or the use of such drugs as ether, chloroform, chloral, or morphia. Clinical observation, however, points to over-consumption of carbohydrates in the diet as a very frequent cause, especially in sedentary life and occupation. Occasionally, digestive disturbances, or want of inverting ferments in the intestines, prevent the proper inversion of the disaccharide sugars, cane sugar, beet sugar, lactose and maltose, and if these pass into the blood uninverted, cane sugar and beet sugar are slowly, but totally, excreted by the kidneys. Lactose, for the most part, is excreted, whilst maltose is, in small part, assimilated, but for the most part excreted. The same result follows ingestion of these sugars in quantities greater than the amounts of invert ferments in the intestines are capable of transforming. The monosaccharides, dextrose, galactose (inverted lactose), and lævulose, which are easily assimilated and stored, are usually met with in very small quantities, and can only appear in the urine after the ingestion of quantities greater than can be stored.

The most prevalent cause of carbohydruria, judging from a large number of examinations of the urine, is diet in which the proportions of carbohydrates, proteins, fats, and inorganic salts are imperfectly balanced, and the study of this, which we will call the quadruple alliance, is both very interesting and important. On the functions of the proteins, and the ions of the inorganic salts, which enter into this alliance, Dr. Benjamin Moore has contributed a very interesting chapter.[3]

By the bioplasm or proteins, the carbohydrates, fats, and inorganic salts in the body are held in a union so homogeneous, when the diet is properly balanced, that neither fats, carbohydrates, proteins, nor inorganic salts betray their presence, and whatever the mysterious force is which binds them together, it is so feeble that the presence of a slight increase of CO_2, or of an anæsthetic, such as chloroform or ether, in the inspired air is sufficient to dissolve the union, and set free the carbohydrates. This takes place even if the inspired air contains the normal or even an excess of oxygen, and the balance is re-established when the CO_2 or anæsthetic is expelled by passing pure air through the mixture. Dr. Moore also found that, "In the living animal, when there is more than a certain percentage of CO_2 in the respired air for a given period, there invariably appears sugar in the urine in very considerable amount, and that also in the case of prolonged anæsthesia, especially if the concentration of the anæsthetic is increased to the maximum limit, there always appears sugar in the urine, often in high percentages."

In the quadruple alliance, sugars take the first place as producers of heat and energy.* From a monetary point of view, they give out these at a smaller cost per unit than proteins and fats. They are, also, more readily assimilated. There is, however, a strict limit to their utility, for they use up more of the oxygen in the inspired air, and give out, as a troublesome bye-product, more CO_2, for each unit assimilated, than proteins and fats. A simple analogy will make clear their relationship in the diet to proteins, fats, and inorganic salts. The cheapest of coals is blind coal, which is reduced to ashes in a suitably constructed furnace, into which no air can enter, unless by passing from below upwards through the bars of the grate and burning fuel; but it will not burn in an ordinary open grate, for it soon gets separated from the air by a dense covering of cold CO_2 which it gives out, and which, being heavier than air, acts as an extinguisher. If, however, under these conditions we add, to the blind coal, oil, or fat, the combustion will proceed, for the fat and coal together give out more heat, and less CO_2 for each unit of the mixture consumed than for coal alone. This heat, by warming and driving off the CO_2, allows the oxygen of the air to come into contact with the smouldering mass.

Sugar, like blind coal, cannot burn in a limited draught of air, for it gives off in burning too much CO_2, and the body is the counterpart of the open fireplace, for into it air is only admitted on inspiration. Fat, then, is an essential in the quadruple alliance, because it gives out 9·3 calories of heat for each unit consumed against 4·1 for sugar, or 4·1 for protein, and in giving out these calories it gives out less CO_2 per unit than sugar. It is, therefore, not only able to supply the heat necessary to drive off the CO_2 but also to supply a reserve of heat when more is required, as when the temperature of the air surrounding the body is lowered.

In our open fireplace, five natural sequences would hinder the fire from burning the allotted span of a human life—threescore and ten years :—

1st.—The fat liquefied by the heat would desert the coal,

---

* Heat and energy are used throughout this paper as transmutable.

and be lost in the ash box.
2nd.—The grate bars would gradually disappear in waste.
3rd.—Fresh combustibles would require to be brought into the fire.
4th.—Waste or ashes would require to be removed.
5th.—Some outside influence would be required to regulate the rate of combustion and the carrying out of these acts.

In the economy of the body, the proteins not only give out heat themselves, but, also, keep in affinity with themselves the carbohydrates and fats. Further, they supply the material for repair, and, also, in a contingency, supply carbohydrates when the supply of sugars runs out. Still further, they keep in affinity with themselves not alone the carbohydrates and the fats but, also, our fourth ally in the quadruple alliance—the inorganic salts, the ions of which set a train of forces in motion, within and without the alliance, by which combustibles are consumed, fresh combustibles absorbed, waste and effete products are removed, and the rate of combustion regulated, so that it never rises or falls in health above or below the required temperature of 98°·4 F. The inorganic salts, therefore, although not of themselves heat or energy producers, are an indispensable ally in the grand quadruple alliance. (For minute description of this consult [3].)

Continuing the causes of carbohydruria, an important cause remains to be considered before we can perfectly trace each cause to its origin, viz., carbon dioxide, which, as a cause, when present in supernormal amount in inspired air, we have already noticed in Professor Moore's observations. We have, however, to observe that when it accumulates in the body, owing to defective excretion, carbohydruria also appears. We have examples of this in pulmonary phthisis and affections of the respiratory organs, and also in rickets, where a state of inanition, or sometimes actual pain, interferes with respiration. In both of these conditions we frequently have another co-ordinate symptom besides the presence of carbohydruria to guide us, in the profuse perspiration which breaks out, over the face and head, when the patient falls asleep and respirations become shallower and slower. The cause of this has been very clearly explained by the late Sir Lauder Brunton.[4]

In the case of carbohydruria due to an increased percentage of CO_2, in inspired air, we have a concomitant symptom when we find calcium supercarbonate in the urine. The urine, which is feebly acid or amphoteric in reaction, gives a white, cloudy precipitate on heating, which is almost indistinguishable from albumen, but disappears with effervescence on the addition of acetic acid. Observations and inquiries, extending over a year, which I have made, have attested that in every case in which calcium supercarbonate appeared in the urine, air with a supernormal percentage of CO_2 had been breathed, and in every case in which ventilation was rectified the supercarbonate disappeared from the urine. In some of these observations, however, a curious anomaly occasionally took place. In urine, which, at first, had an excess of sugar along with supercarbonate, subsequent examinations gave only a normal, or slightly supernormal, percentage of sugar, and little or no diminution of supercarbonate. Evidently, the body had set up a defence, the CO_2 had been rendered innocuous, and the quadruple alliance had been restored to its normal equilibrium.

For an explanation of how this came about, let us follow the course of the CO_2. Probably excreted from the lungs of the same patient, if it could have escaped into the outer air, it might have got into some member of the vegetable kingdom and returned to the body of the patient as a carbohydrate by the only legitimate path, through the digestive organs. Having no means of escape from the dwelling, it was involuntarily drawn into the lungs of the patient, and passed into the arterial blood, where it might have remained to be passed on to the veins to be excreted by the lungs. This procedure, however, it is apparent, would not have put it out of action, or mitigated the evil in the atmosphere, so the body adopted a better plan. That the CO_2 worked mischief by dissolving the quadruple alliance, we had evidence from the increase of sugar in the urine, but its evil influence did not end there. For further information as to what followed this we must consider a law enunciated by Professor Herter of New York whilst demonstrating the bactericidal action of alkaline blood, viz., that " If a current of CO_2 is passed through the blood, it displaces a portion of the albuminates, especially in the red cells, where the combination of alkali and albumen is most abundant, with the result that the newly formed carbonate diffuses into the serum and renders it more alkaline.[5]"

Entering into combination with calcium in the alkaline blood, the inspired CO_2 formed soluble calcium super-carbonate, and in this combination was expelled in the urine, and under ordinary circumstances would have found its way into the ground. In our test tube, however, it is interesting to observe that between heating and addition of acid, with all the luck of "the monkey that would not kill," the CO_2 again made good its escape into the atmosphere.

Of a large number of cases investigated, in which calcium supercarbonate was present in the urine, the majority were due to badly ventilated dwellings, or offices, but several were due to patients, although in well ventilated rooms, having slept with nose and mouth completely enveloped in blankets.

The following case, however, illustrates the difficulty sometimes encountered in getting at the truth.

Miss A. K., teacher, lived in a well-ventilated house, on a well-balanced diet, controlled by monthly examinations of the urine. After months of normal health, a specimen of urine showed carbohydruria, and a copious reaction for supercarbonate. When accused of having violated her good rules of living and hygiene, she replied, "That she had, in no way, departed from either her rules of diet or ventilation." Later it transpired that, for the previous two weeks, the ventilation in the school, in which she taught, had been at a standstill, owing to a breakdown in the propelling machinery by which the air was filtered and transmitted to each room, and the want, owing to the war, of an engineer who could repair it.

Having considered the method of detecting carbohydruria, and the causes of carbohydruria, let us now consider, from a clinical point of view, the condition of the body when the urine contains, it may be only three, four, or more parts per 1,000 of alimentary sugar. We have already noticed the tendency on the part of the body to retain any carbohydrate introduced into it. This is all the more striking, if we compare the behaviour of the body when salt is introduced, with that when sugar is introduced. When salt is introduced to the extent of half an ounce into the body by transfusion, the salt so introduced is, for the most part, got rid of in about two hours by renal secretion. When sugar is introduced in greater quantity than can be utilized, judging from observations on over 2,000 urine examinations, it is rarely excreted by the kidneys in quantity over four per 1,000, which would give for two hours' excretion 8½ grains, when 50 ounces of urine are excreted in the day.

Hitherto, the prevailing idea has been that when sugar, which has entered the system, is not directly oxidized to make its escape by the organs of respiration in the form of CO_2, it is converted into glycogen, or animal fat, and stored as a reserve. Clinical observation, however, clearly indicates that when carbohydruria prevails, a large quantity of untransformed sugar must be stored in the form of a dilute aqueous solution in the intercellular spaces. In support of this hypothesis, carbohydruria frequently continues for weeks, and sometimes for months, after excess of carbohydrates has been kept out of the diet, and proteins and fats substituted. This would not be the case, if there was not an excess of reserve carbohydrate returning into the blood.

Further, on the substitution of protein and fat for part of the carbohydrates, as sugar diminishes or returns to the normal percentage in the urine there is a considerable loss in the weight of the body. As extra fat is being introduced in the diet there should be no loss of weight from the stored fat of the body, hence the loss must be in the form of water which is no longer required to preserve the osmotic equilibrium in the body. In the case of growing children, and, also, in some adults, this initial loss is soon made up when a faulty diet is corrected, by the addition to the body of more substantial tissue and reserve fat. In a large number of adults who have adopted this change in the diet, the initial loss has been from 4 to 14 lbs. or more, and, in every case, the patients have affirmed that what they have lost in weight they have gained in energy. Further, when coldness of the extremities was a symptom, it disappeared under the altered diet.

The following cases illustrate the effects produced by a change of diet :—

CASE I.—A departmental superintendent in a large mercantile house in the city, aged 66 years, height 5 ft. 10 ins., weight 17 st. 11 lbs., in January, 1917, suffered from dyspnœa, very severe on exertion. His face, especially under the eyes, showed a transparent fullness, his body was tumid, hepatic area firm and resistent on palpation, tongue full and marked by indentations from the teeth, conjunctiva on everting lower eyelids pale and anæmic. Feebleness, languor, and depression were very apparent. His breakfast had, for many years, consisted of a large bowl of oatmeal porridge with milk, followed by sweetened tea, a slice of toasted bread, and butter. This was altered to one consisting of bacon with untoasted bread, and unsweetened tea. His other meals required little alteration, but sugar was completely stopped in the diet, sweetened farinaceous puddings forbidden, and thin bread freely spread with butter took the place of bread and butter. On November 28 his weight was 15 st. 5 lbs., a fall, in 11 months, of 34 lbs. His girth was reduced 6 inches, and his collars had to be replaced by others an inch shorter. As no drugs were used, the loss in weight was entirely due to change in diet, and as the daily income of fat was increased, the loss in weight was not likely to be due to the loss of stored fat. His appearance is now that of a much younger man. He displays increased activity in brain and muscle. His dyspnœa, except on severe exertion, and his anæmic appearance have gone. He affirms that he feels stronger than he has done for years, and his statement is corroborated by his daughter, who states that, in walking, she now has a difficulty in keeping up with his pace, and, further, that stertorous breathing, during sleep, which he had for a long time before treatment, has entirely disappeared.

Case 2.—A clergyman, in middle life, suffered from chronic dyspepsia, eczema, languor, depression, and muscular atony. His greatest error in diet was frequent and excessive drinking of highly sweetened tea, the result of which was a carbohydruria of about 4 per 1,000. His diet was altered, as in Case No. 1, he made steady progress in gaining strength, and his eczema gradually disappeared. It was, however, remarkable that although his diet was so altered it was, approximately, four months before the sugar in his urine became normal in amount. He states that, although his body weight has been considerably reduced, he feels stronger and more energetic, and can take a note much higher in tone than he has done for years.

Case 3.—A post office official, aged 55 years, had been confined to the house for four months, with rheumatism, for the greater part of which he had been in bed, and when he came under observation was feebler and worse than ever he had been, although all the usual drugs had been tried. His tongue was very full and indented, and body and all the larger joints tumid, swollen and painful, but with little or no hyperpyrexia. Carbohydruria was a prominent symptom. Evidently on the assumption that his rheumatic condition was caused by uric acid or purins, he had, throughout, been kept on a low diet, from which all red meats had been excluded. As examination of his urine indicated that his kidneys were all right, his diet was changed to a liberal one of fats and proteins, with the same restrictions as in No. 1. Although practically no change was made in the drugs formerly used, he made a steady and uninterrupted recovery, and with the help of a competent masseur was able to resume his duties in less than two months. He has now been able for duty for 3½ years.

Case 4.—One of our civic magistrates, in advanced middle life, suffered from eczema of face and body, accompanied by languor and lassitude, and his urine indicated about 4 per 1,000 of sugar. The history was of excessive drinking of highly sweetened tea, and neglect of proteins and fats. In addition, a tablespoonful of golden syrup had been taken daily, in the morning, to prevent constipation. On correcting the diet he made a steady and rapid recovery. Interviewed 13 months later he stated that he had diminished in weight, but felt more energetic than he had done for years, and that, although he did not like his sugarless tea a bit, during this period he had only once had pain from acidity in the stomach, after some little indiscretion in eating, but that before his change, in diet, this had been almost a daily trouble.

Reviewing the results of urine examination in over 1,000 cases which indicated carbohydruria, the most frequent associated disorders were anæmia of the chlorotic type, occasionally accompanied by cardiac murmur; cardiac atony; varicosity of veins and hæmorrhoidal vessels; tumidity of tongue, and of the abdominal organs; constipation, probably, in part, due to atony of involuntary muscles of intestines, and, in part, to diminished lumen of the intestines, due to dilatation of the blood-vessels.

In a large percentage of cases, fermentation, acidity, and flatulence in the stomach and intestines were present. Atony of voluntary muscles, particularly of lower limbs, which, in severe cases, culminated in falling of the instep arch and flat foot, was also frequent, and, in children, sweating over head and face during sleep, chorea, convulsions, and all the other manifestations of rickets. In both adults and children, bronchial catarrh, hypostatic in character, and unaccompanied by any febrile symptoms was frequently present. Hæmorrhages from the vessels of the conjunctiva and retina, and also of the uterus frequently accompanied the carbohydruria. The association of carbohydruria with chlorosis offers an interesting and important field for further investigation.

As the outer envelope of the red corpuscle is impervious to both cane sugar and glucose, it cannot be sugar—*per se*—

which causes the loss of Hæmoglobin.[8]

Two important problems worthy of investigation remain—

First. Has the increased amount of aqueous fluid in patients, such as the one cited in Case 1, an hæmolytic action when, on an added increment of sugar, it is recalled into the vascular system ?

Second. To what extent is chlorosis due to the destructive effect of CO_2 on the red corpuscles, when inspired in supernormal percentage ?

Another, as yet untouched but interesting and important, field for observation is the effect of these same conditions on the white corpuscles, in particular of the polymorphonuclear corpuscles, which play such an important part in the defences of the body against septic invasions, and notably of tuberculosis.

In causing the malaise and feebleness associated with carbohydruria, undoubtedly hyperhydræmia, by increasing the work of the cardiac muscle, plays an important part. If the vascular system, which normally contains about six pints of blood and can accommodate nine pints without increasing the blood-pressure, is called upon to circulate nine pints, the increase of labour to the heart must be enormous, more especially as, in this plethoric condition, the elastic recoil of the arterial walls is lost. That this plethora is sometimes exceeded is suggested by the hæmic murmur, which occasionally accompanies chlorosis, and subsides as the anæmia subsides.

In correcting the diet when these disorders make their appearance, the rule which I have followed is to diminish, to the utmost, all soluble carbohydrates, and increase, to the utmost, fats and occasionally proteins, until carbohydruria disappears. Unless the carbohydrates are diminished, the fats are neither properly digested nor assimilated, and if we take a hint from the ratio of fats to carbohydrates in the natural food of the infant at the breast, the ratio of fats (which is 26·4 to 52·4 of the latter) is largely in excess of what is required for metabolism, for the fat content of the fæces ranges from 10 to 20 per cent. Unabsorbed fat, therefore, plays an important part in preventing constipation. As obstinate constipation has, in a number of cases, completely disappeared under the altered dietary, the law enjoined is to "spend on fats and proteins what is saved on sugar."

In making these changes, the question arises, "How are we to know when we overdo the correction of diet, and cause starvation from want of carbohydrates?" In this, the urine is our guide, and when 1 or even 1·5 per 1,000 of sugar is reached, it is a good and safe rule to try if more carbohydrates can be assimilated. So far, I have never had an experience which indicated starvation. It is, however, well to bear in mind the signs of starvation. Of these, feebleness, with a subnormal temperature, is what one would expect, but this is frequently a sign of overfeeding with carbohydrates, and, except in diabetes mellitus, if accompanied by an excess of sugar in the urine over 1·5 per 1,000 to be so interpreted. On the other hand, a feeling of well-being on the part of the patient is a positive sign that all is right. Except in the case of diabetes mellitus, the presence of diacetic acid or acetone in the urine is a sign of carbohydrate starvation. On full diet, there should be present in the urine 15 to 40 grammes urea, 10 to 15 grammes sodium chloride, and 2 grammes sulphates, daily. If there is a large diminution in these proportions, and no concurrent disease, or if the amount of phosphates is largely increased over 5 grammes daily, either feeding or assimilation is wrong.

Let us now briefly consider the suitability of the various carbohydrates to the conditions of everyday life. The starches entering into the diet in the form of wheat, oats, rice, potatoes, vegetables, etc., being the most insoluble of the carbohydrates cannot enter the blood until inverted, and as this process is slow and gradual, time is allowed for complete storage, so they rarely cause carbohydruria. As cooking, however, promotes inversion, and as oatmeal, in the form of porridge, is in Scotland frequently cooked from 30 to 60 minutes, and taken in excessive quantities in addition to other food, it is a frequent cause of carbohydruria. This is frequently aggravated by the addition of sugar to the porridge, and little or no fat being taken at the same meal.

For infants, when artificial feeding is a necessity, the most suitable carbohydrate is milk sugar. It is unfermentable with yeast, and, therefore, reduces to a minimum the chances of flatulent colic. It requires six times its weight of water for solution, and, therefore, has not the cloying sweetness of the other sugars. It requires to be inverted into galactose before it is transported into the blood, so that solution and inversion prevent it from being too rapidly absorbed, and allow time for its complete transformation into storage combinations. If absorbed into the blood uninverted, its insolubility and indiffusibility keep it within the pale of renal action, and it is excreted, for the most part, before it can enter the extravascular fluids. It is the carbohydrate selected by nature for the infant, and should be the prototype of any carbohydrate used in the feeding of infants and invalids. Compare with it dextrose or glucose as prepared by inversion by means of heat, diastase, or any other ferment from wheaten flour! It is easily and rapidly fermented in the intestines. It does not require to be inverted, is soluble in its own weight of water, cloyingly sweet, and absorbed so rapidly that frequently a large proportion is not transformed into combinations for storage in the body, and, therefore, passes into the extravascular fluids. Administered without a due proportion of cream or milk, as it usually is, it is in the urine of infants the most frequent cause of carbohydruria—carbohydruria accompanied by disorders of the very worst type, and all the symptoms of rickets.

The administration of such foods to adult invalids, or patients suffering from tuberculosis, at once augments the amount of sugar in the urine, where previously it was moderate, and this is very frequently accompanied by diaphoresis during sleep.

Considering the value of cane or beet sugar as an article of diet, in the adjustment of diet when there was carbohydruria, I found it practically impossible to obtain the normal standard when cane sugar was allowed in the diet. This may, in part, be ascribed to the number of patients employed in sedentary occupations in a large city. Before the sugar rations were restricted by the British Government, the number of standard urines, when diet was not restricted, did not exceed 1 per cent., and a large proportion of urines contained 2 to 3½ per 1,000. Since the restrictions came into force, amongst the labouring classes and those with outdoor exercise, normal standards are frequent, and high percentages more rare, but in every case in which the patient has given up the use of sugar in tea, coffee, and cocoa, and increased fat and protein feeding, the improvement in health and strength has been so apparent that, with very few exceptions, all have pledged themselves not to return to it, and in a great many cases where one individual in a family tried the change, the whole household has adopted it. After 4½ years' trial of the system, I am personally in a position to remark that, in brain and body, I feel considerably better and stronger than I did five years ago.

Compared with glucose, cane sugar is, in many respects, even worse in the disorders which accompany carbohydruria. Its solubility of two parts in one of water, its rapid absorption uninverted, when taken in the quantities used before the restricted rationing, its great and rapid diffusibility whereby it mixes with the extravascular fluids before it can be secreted by the kidneys, and, above all, the impossibility of its ever being assimilated if it enters the blood uninverted, render it, except in extreme moderation, very objectionable as an article of diet. To get a normal standard of urine, if used in the proportions in which it has formerly been used, it will be necessary to remove from the diet nearly all the cereal, fruit, and vegetable foods, and as sugar contains no inorganic salts, which these do, our quadruple alliance would thus lose an indispensable unit, and one in the absence of which sugars, proteins, and fats cannot be utilized in the body. To preserve these inorganic salts in the diet whilst living on sugar, the only course would be to masticate the cane and extract the unrefined sugar by suction, as the natives of the tropics are in the habit of doing. That cane sugar can be inverted and assimilated in large quantities, whilst a person is undergoing extraordinary muscular exercise, has been demonstrated by Vaughan Harley, who, whilst undergoing muscular labour 61 to 76 per cent. above normal, consumed 17½ ounces per day, but the conclusions of Prautner and Stowasser, who made similar experiments, are "That sugar is a specially valuable food for persons who have to perform a single muscular effort, especially if they are obliged to do so in a state of exhaustion."[7]

Cane sugar, then, must be looked upon as a luxury, and not a necessity as an article of diet, except for those who are called upon to give out extraordinary energy for short intervals, and might, in time of war, be eliminated altogether from the diet of those who follow sedentary occupations, and the freightage employed in its transportation used in the distribution of the essential fats and proteins. On this point there is much need for educating the public, who bewail with an admonitive outcry the harm which will befall growing children as the result of the Government restrictions in the supply of sugar—an outcry which is well met by the dictum of a shrewd contemporary, Dr. Sim Wallace, " That every penny spent by the poor in jam or sweets is absolute waste, because they eat so much bread, which contains quite sufficient sugar for the system."

The last sugar which we have to notice is maltose, which has now found a place in diet in extract of malt. Like glucose, it is very soluble in water, and readily ferments in the intestines. Whilst its absorption, delayed by its inversion into glucose in the intestines, allows time for its conversion into storage combinations, and also that it has the advantage of being in part assimilated, should it enter the blood uninverted, when administered in the quantities usually prescribed, a standard urine is almost impossible to attain. This is probably due to the diastase, usually present in malt extracts, over-inverting the necessary quantities of other insoluble carbohydrates present in the food, and is a serious objection to its use, especially in those diseases in which carbohydruria is already present.

Reviewing our observations, on the place and function of carbohydrates, proteins, and fats in the diet, it is apparent that the extent to which carbohydrates can take the place of proteins and fats is a very limited one, and can best be regulated by clinical observation on the urine in each individual case. Whilst the carrying out of these observations must, at first, entail an increase of work on the part of the practitioner, it is apparent that, in the end, it will diminish work and worry by shortening the course of many disorders, and by preventing avoidable disease. The devastations of a great and protracted war, with its enormous sacrifice of valuable lives, renders the life of each survivor, old and young, more valuable to society and to the State. In the spirit of self-sacrifice, which has ennobled and animated the lives of the fallen, let it be our determination to do our bit in the alleviation and prevention of suffering, and in the preservation of the lives left to us, and thus bring about the consummation and realization of that Utopia, which has been the hope and aim alike of poets and philosophers in every age.

REFERENCES.

[1] Leonard Hill: *Further Advances in Physiology*, Arnold, London, p. 170.

[2] Martindale: *Extra Pharmacopœia*, H. K. Lewis, London, Vol. II.

[3] Leonard Hill: *Further Advances in Physiology*, Arnold, London, pp. 1 to 33.

[4] Lauder Brunton: *Circulation and Respiration*, Macmillan & Co., London, pp. 550–551.

[5] Herter: *Lectures on Chemical Pathology*, Smith, Elder & Co., London, pp. 6–7.

[6] Lazarus-Barlow: *General Pathology*, J. and A. Churchill, London, pp. 165–166.

[7] Robert Hutchison: *Food and the Principles of Dietetics*, Arnold, London, pp. 281–283.

[8] Starling: *Principles of Human Physiology*, p. 819. J. and A. Churchill, London.

◆

NITROGEN AND CANCER.

By JOHN THOMSON SHIRLAW, M.D.

Upholland, near Wigan.

In the study of the cancer problem, we should consider not only the morbid anatomy of the growth, but the possible alterations of the vital processes in the economy which precede or accompany it. When studying these vital processes, we must not allow ourselves to be confused by the complexity of structure and the corresponding complexity of function in the human organism, which have accompanied its rise in the evolutionary scale. On the other hand, we must keep in view the fact that the same laws of Nature, which govern the life of a single cell, apply with equal force to the life of the cell aggregate.

All living substance is protoplasm, a compound of carbon, hydrogen, nitrogen, and water, and life is simply a constant succession of chemical changes in this compound. It is advantageous to consider the parts played by each of these bodies. The carbon and oxygen, by their combustion, provide the heat, without which chemical reactions cannot take place. The transformation of the contents of an egg into an organized chicken is a question of heat; withhold heat, and the process does not begin; supply heat, and it grows while the temperature is maintained, but ceases when the egg is allowed to cool. The metamorphosis of insects presents like relations of cause and effect; the hatching of their eggs is determined by temperature.

The hydrogen and oxygen combine to form water, a fluid condition facilitates chemical change. When the water supply of a plant is cut off, its formative changes are arrested, and the plant withers. The Rotifera may be rendered apparently lifeless by desiccation, and yet revive when wetted. And in different parts of the same organism changes are more rapid in the more succulent tissues. Thus, in a tree, structural changes go on quickly at the ends of the shoots, where the ratio of water to solid matter is very great, while they are very slow in the dense and almost dry substance of the trunk. Similarly in animals, we have the contrast between the high rate of change going on in soft tissues, and the low rate of change in hard, non-vascular tissues like the hair and nails.

Is the remaining constituent of protoplasm, nitrogen, also necessary for the chemical changes constituting life and growth? Undoubtedly it is. It is well known that all combinations, into which nitrogen enters, are unstable and unusually prone to decompose. As an illustration of this, we find that nitrogen enters largely into the composition of high explosives. A breeder of prize cats will tell you that, in order to obtain a fine animal, it must, when young, be given proteid in the form of finely divided raw meat. Schafer, in the course of an experiment on feeding quite young rats with small amounts of thyroid tissue, found that an acceleration of growth accompanied retention of nitrogen in the body. The agriculturist knows the value of nitrogen, for it is one of the ingredients of patent manure; sulphate of ammonia, which contains a large amount of nitrogen, is frequently scattered over young cereals to hasten growth and produce large crops. Conversely, a deficiency in the supply of nitrogen has its effect in stunted growth and development. In biliary cirrhosis, the supply of nitrogen to the body is lessened, and growth is interfered with; the appearance of the child may be infantile, and bodily development is greatly retarded, so that the onset of puberty is arrested.

Nitrogen, then, confers on protoplasm the property of instability, and the more unstable the protoplasm is, the more rapid are its chemical changes, and the more rapid the growth of the cell. It can be understood how the chemical dissociation of a nitrogenous compound must be rapid, when one remembers that, on nitrogen liberating itself, it does so with an explosive effect, thereby violently agitating all the elements of the compound. In the case of protoplasm, the excessive heat which is apt to follow—indeed, must follow—the accelerated oxidation of its carbon, is neutralized by another peculiarity of nitrogen, namely, that, on its liberation, it does not generate heat but absorbs it.

To summarize :—

(*a*) Life and growth are chemical changes in the protoplasm. This is a natural law—to deny it, we must also deny the persistence of force.

(*b*) Heat and a fluid condition are necessary adjuncts for chemical change.

(*c*) The amount of growth is regulated by the amount of chemical change, *i.e.*, by the degree of instability of the protoplasm.

(*d*) The degree of instability of the protoplasm is, in its turn, regulated by the amount of nitrogen it contains.

Let us now apply these considerations to the cancer problem. There are really only two facts in relation to the genesis of this disease which cannot be disputed. One is, that cancer has its site at some focus of irritation, thermal, mechanical, or chemical. Whatever be the nature of the irritation, it means cell death, and if we still refuse to be led astray by the complexity of the tissues, and think of them only as composed of protoplasm, we know that, as the result of retrograde metamorphosis, there are formed two groups of substances—one group composed of carbon, hydrogen, and oxygen alone, the other containing the whole of the nitrogen. This liberation of nitrogen brings about an increased instability of the protoplasm of the adjacent cells, and, therefore, their more rapid proliferation. I believe it is this process which underlies the healthy repair of tissues. Ross and Cropper have carried out some important investigations with what they call "auxetics," substances which have the power of inducing division, and have found that the principal auxetics are extracts of organs which occur naturally in the process of katabolism, and are, therefore, nitrogenous. They, moreover, discovered that the action of auxetics is powerfully stimulated by bodies which result from putrefaction, again, highly nitrogenous substances. Parallel conditions may be observed in the vegetable world, where decomposed manure—the more decomposed the more nitrogenous—is added to the nitrogen already in the soil in order to induce growth.

The second fact which admits of no dispute is that cancer, as a rule, occurs after the meridian of life is passed. Senile decay of the body is a decay of its glands, all other changes being secondary; and if we grant that the *rôle* of nitrogen in the metabolism is so important, we naturally turn to those glands which are concerned with the excretion of the nitrogenous compounds, and which, up to now, have kept the nitrogenous balance steady. Such are the spleen and liver, and, perhaps, some other glandular structures, of which more will be said hereafter.

It may be said that the spleen can be excised, and yet the patient live. But one cannot find an account of the prolonged after-history of these cases, nor of any changes in the body subsequent to excision. Except when there has been an accessory spleen, restoration to permanent health has yet to be proved. Two cases of splenectomy, brought by Messrs. Ballance and Pitts before the Clinical Society, are very interesting. In one, a boy aged 10, it was noticed at the operation that a spleniculus was left behind. The boy recovered rapidly, and was in robust health five months later, but the superficial glands had enlarged. In the second case, that of a woman aged 45, though the patient left the theatre in a desperate condition, she was apparently convalescent in ten days. Then she began to go downhill, and by the 18th day, her condition was again critical, with weakness, emaciation, thirst, drowsiness, etc. The administration of extract of sheep's spleen and raw bone-marrow daily restored her gradually to convalescence, and ultimately to complete recovery. Some groups of external lymphatic glands could be felt in this case. In view of what is to follow presently, I wish to emphasize this glandular enlargement.

The physiology of the spleen is still vague, but we do know that it contains a remarkable series of ferments acting on nitrogenous bodies, converting them ultimately into uric acid. Spleen-substance is rich in nucleo-proteins, and if it is left to digest itself at a suitable temperature, xanthin and uric acid are formed *in situ*. Certain it is that primary tumours of the spleen are extremely rare, and even secondary metastases are by no means common, showing that its cells have the peculiar property of resisting the stimulating effects of the nitrogenous compounds it has to deal with, in the same way that the cells of the mucous membrane of a healthy stomach are not affected by the gastric juice.

The uric acid formed in the spleen is brought to the liver, where it is changed into urea. That the functional activities of the spleen and liver are intimate, is manifested by the occurrence of early enlargement of the former organ in biliary cirrhosis; it has been proved, too, that this is not due exclusively to passive congestion. Still, I consider that the liver acts more on nitrogenous bodies, after they have been removed from the blood-stream.

I mentioned that some other glandular structures may be concerned in the excretion of nitrogen; they are the lymphatic glands. The serum which bathes the tissues, returns to the circulation by two sets of capillary vessels: the blood-capillaries and the lymph-capillaries. They are not in contact, neither are they continuous with each other. On looking at a diagram of the lymphatic system, one is struck by Nature's ingenuity in providing such a perfect drainage system, even to the extent of creating settling tanks or separators in the form of lymphatic glands. Nor are these present in one part of the body only, for they are found in every organ and in every tissue. It is absurd to imagine that these glands have been evolved for the purpose of anticipating bacterial invasion from outside sources; their inflammation in blood poisoning is merely evidence of their depurative functions. On the contrary, it is more reasonable to assume that they are constantly taking a part in the vital economy. Attention has been drawn above to the glandular enlargement, evidently a compensatory hypertrophy, after splenectomy,—this is confirmed by several observers,—and the resemblance between the structure of the spleen and the lymphatic glands is very definite, the only difference really being that, while in the latter the stream which flows through the organ is lymph, in the former it is blood. It is my belief, therefore, that the lymphatic glands assist in the breaking up and elimination of the nitrogenous products derived from protoplasmic changes.

To those who may say "But why all this fuss about nitrogen? Surely, perfect though evolution is, it would never think of setting up such elaborate apparatus, simply to excrete nitrogen," I answer: "You know that protoplasm breaks up into its constituents, and yet you have only considered the elimination of the carbon, oxygen, and hydrogen. Is not the respiratory apparatus highly developed, and are not the renal system and the skin elaborate ?"

It is because the spleen and lymphatics are so hidden away, and we cannot see their workings, that we jump to the conclusion that they are of little value. I take up a text-book, and read "the spleen is functionless." Never was Nature so insulted. Biologists have gone too fast ; they have lost sight of the cardinal fact that the growth of a single cell, a simple globule of protoplasm, is governed by the same laws of Nature as the growth of an aggregation of cells. Evolution differentiates the tissues only; it cannot alter the organic constituents of the protoplasm. As Ernst Haeckel says, biologists have been led into great confusion by mixing the chemical and morphological ideas of protoplasm; they have been studying, with the aid of the microtome and delicate stains, the finest structural features of the organism, but "these microscopic structures are not the efficient causes of the life process, but products of it. They are phylogenetic outcomes of the manifold differentiations, which the originally homogeneous and structureless plasm has undergone in the course of millions of years. Hence I regard these "plasma" structures (the comb, threads, granules, etc.) not as original and primary, but as acquired and secondary."

After middle life, then, the functional activities of the spleen and lymphatic glands begin to fail, and there occurs a slow and gradual accumulation of nitrogen in the blood and tissues. It may be argued that, from a corresponding failure of the protoplasmic activities of the cells of the rest of the body, the amount of nitrogen must be proportionately reduced. But, as I have already stated, senile decay first affects the glands. Are not the symptoms accompanying the "change of life" due to glandular failure?

Thus, there is a critical time when nitrogen is in excess. Again, my critics say, "Why particularize nitrogen?" Because failure of glandular function does not affect the excretion of the protoplasmic constituents equally. The excretion of carbonic acid and water is simple, and is more to be explained by physical laws; that of nitrogenous bodies is performed by a process of chemical elaboration. In some people, the altered condition of the system is capable of being compensated, and, no doubt, this power of adaptation varies in different families—the influence of heredity. In others, the organic adjustment is too precise, and if in them the cells of a certain part of the body have already been stimulated by the presence of nitrogen, accruing from the constant death of their predecessors, their protoplasmic molecules being thus in a state of rapid change, it is just this little extra supply of nitrogen which is needed to stimulate further these changes, and, therefore, the growth and division of cells. Remember that the protoplasm of the cells of tissues, which have not been previously subjected to irritation, is not in the same rapid state of molecular change, and fails to respond to the nitrogenous whip; before it can do so, it requires more heat from the oxidation of its carbon, and does not get it; it needs more water for the more rapid chemical changes it is asked to perform, and cannot obtain it. The protoplasm is getting older, therefore colder and drier. Moreover, it has not been kept young by the nitrogen which, in the case of their irritated brethren, has been supplied to them from the death of their ancestors at a time when they were able to make use of it. It is exactly the same in the vegetable world, for sulphate of ammonia, to be of any value, must be applied to plants when they are young and tender; mature plants are not affected by it.

This nitrogenous theory will explain the preference of cancer for certain sites, for it generally appears in tissues mainly formed of highly compounded, nitrogenous molecules, in which changes are most active, while parts which, like deposits of fat, consist of relatively simple molecules that are weak in nitrogen, and are, therefore, seats of but little change, are passed by.

The treatment of cancer based on this theory is naturally to supply the ferments normally acting on nitrogenous bodies, therefore to give to the patient extracts of the spleen and lymphatic glands. There is one very interesting fact in the pathology of malignant disease which must be mentioned. It is this: as a rule, sarcomata infect the system through the medium of the blood-vessels, while carcinoma is disseminated chiefly by the lymphatic system. This rule, like many others, has exceptions, yet nothing is more common than to see secondary growths of sarcoma in the lungs, liver, and other organs without the lymphatics ever having been affected. The reverse is the rule in carcinoma. From this fact, we may infer that the serum of the connective tissues is absorbed by the blood-capillaries, and its nitrogen dealt with by the spleen, while that which bathes the epithelial cells has its nitrogen attacked by the lymphatic glands. If that is really so, we expect lymphatic gland extract to destroy the malignancy of a carcinoma, and splenic extract, that of sarcoma. This is a matter for clinical experiment. But, seeing that the structure of the glands is so similar, I would, if a personal sufferer, take a mixture of both. It is not for one moment to be supposed that this treatment can remove a tumour already formed; all it can do is to destroy its malignancy.

I may say that I have had under my care for the last 18 months a case of carcinoma of the duodenum in an old lady of 70, which has been solely treated with 5-grain capsules of splenic extract supplied by the British Organotherapy Co., with a successful result. I cannot absolutely prove that it was carcinoma, but it was easily palpable, and I was confident enough about the diagnosis. She was at one time so ill with vomiting, pain and pressure symptoms that I told her husband and children to prepare for her death. She, however, steadily improved under the splenic extract, has put on flesh, and last summer walked a distance of five miles to a daughter's home and back. The only drug she took was morphia in the form of pills, and at the beginning of my attendance, I was compelled also to give it hypodermically. All other medicine made her sick.

I am not relating this case as a proof of the success of this treatment; I will leave that to others.

◆

TUBERCULOSIS IN INDIA: ITS BEARING ON TO-DAY'S PROBLEMS.

By C. MUTHU, M.D.

Chief Physician to the Mendip Hills Sanatorium, Wells.

I.—THE PREVALENCE OF TUBERCULOSIS.

THE history of tuberculosis in India presents many points of interest to the western student, for it opens up a large field for research work, and throws a fresh light on some of the problems that confront the West. My recent tour in many parts of that country to study the disease has strengthened my impression of a former visit, in 1913 and 1914, that tuberculosis has made considerable progress in India during the last twenty-five years.

It has increased in big congested cities, in the large manufacturing, commercial, and religious centres, where poverty, overcrowding, and insanitation prevail. In fact, the mortality in cities like Bombay and Calcutta is considerably higher than in Glasgow, Birmingham, and Manchester.[1] It is spreading into the villages, in the educational and boarding institutions, among the poor living in mud-houses or in slums and squalor of crowded towns, among the Parsees, Indian Christians, and students who have adopted western customs with regard to food and clothing, and among Anglo-Indians in humbler circumstances. It is more prevalent among the female than the male population, owing largely to vitiated and insanitary conditions of the Zenanas. All parts of India are affected—Bombay, with its moist heat, Central Provinces, Madras with intense heat, hilly districts like Cashmere, Beluchistan, and Nepaul, low-lying Bengal, Assam, and Gangetic Plains, Burma, Malabar, with big rainfall—all tell the same tale of widespread increase of tuberculosis throughout India.

It is rather difficult to estimate the real extent of tuberculosis mortality from Vital Statistics and Returns. Many a case of consumption is either missed, or mistaken for malaria, enteric or other fevers, or for other respiratory diseases. For instance, out of an annual mortality of more than four millions, officially returned as due to "fever," Rogers (now Sir Leonard) and Stewart state that nine per cent. should be ascribed to tuberculosis, while another authority puts them down as ten per cent., which means that from one item of "fever" alone, a leakage of 400,000 deaths has escaped official notice. After a careful study of all the available statistics and figures, the writer has come to the conclusion, that the annual death-rate from tuberculosis cannot be less than nine hundred thousand to a million; that is, India loses annually a number equal to the population of Bombay or Calcutta.[2]

II.—THE FACTORS THAT HAVE MADE FOR TUBERCULOSIS.

The factors that have brought such a widespread distribution in India have a parallel in this country, when it became a victim to industrial and economic revolution in the early fifties. Those who look merely at the surface of things will attribute this increase to the infection by tubercle organisms. But the student with an insight will go deeper, and trace the disease to the foundation in the change of life and habits in the Indian people when brought into collision with the western civilization. This contact of the East with the West has caused great social, economic, industrial, and spiritual upheavals, as seen in the growth of towns and cities, the expansion of trade and commerce, the depopulation of villages, decay of home industries, migration into towns, high rents and dear food, overcrowding and insanitation, poverty, want, intemperance, and degeneration. These result in an insufficiency of light and fresh air, of food and accommodation, of rest and repose of mind, which have lowered the vital powers of the people and widely opened the door to tuberculosis. So that the broad and general factors that made for the increase of tuberculosis in the West have also affected the East, with one or two additions.

The tropical dust and heat, the debilitating effects of malaria, the hopeless poverty of millions of the Indian poor, who are underfed and overworked, the joint family system, which means living in crowded and insanitary houses, the purdah system, which secludes women in ill-lighted and ill-ventilated parts of the house, the early marriage, which undermines the vitality of millions of youths and maidens —the latter of whom often succumb to tuberculosis after childbirth—and the indiscriminate spitting, all have aggravated the bad conditions and considerably helped to spread the disease.

As regards the relation between consumption of milk and tuberculosis, the writer's contention for years, that milk is not the chief cause of tuberculosis, seems verified by his Indian experience. The Indian authorities are agreed that bovine tuberculosis is very rare among Indian cattle, and yet, as we have seen, tuberculosis is very common in India. Besides, owing to scarcity and dearness of milk, millions of Indian people do not touch milk, and even among those who do, it is a general custom to have the milk boiled before use; and yet tuberculosis of bones and joints is very frequent in many parts of India, as well as tuberculous disease of glands. So that the extreme rarity of bovine tuberculosis, together with the fact that surgical tuberculosis is very frequent among Indian children, who do not drink any milk at all, throws a considerable doubt on the general belief in this country that unboiled milk is an important cause of tuberculosis in children and, later on, in adults.

III.—THE BASIS OF TREATMENT.

In discussing briefly the basis of treatment that should be pursued in India, one is tempted to criticize the existing measures carried on even in this country. There is an uneasy feeling growing among those who are engaged here in tuberculosis and sanatorium work, that our campaign against the disease has not brought that success one expected during the last few years, for it is a disquieting fact that tuberculosis mortality in Great Britain was higher in 1914 than in 1913, and higher in 1915 than in 1914; that our activities in Public Health Service are spent more in trying to destroy infection than in building up the resisting powers of the people; that our treatment is not broad or elastic enough to suit the growing exigencies of the time; that the provision of sanatoria in the Insurance Scheme, boldly copied from Germany, is not sufficient to meet the needs of the consumptive in this country.

I have not a word to say against the sanatorium movement. Those who cry down sanatoria, and those who expect great things from them, are both wrong. An experience of nearly twenty years has convinced me that it has a legitimate place in the treatment of consumption; but its success is limited, and it is only a link in the chain of treatment.

In the plan of action against tuberculosis, three sets of agencies are required to ensure complete success:—

(1) Inquiry Bureau for giving and receiving information; a dispensary system; an out-patient department; a clearing and sorting house to send patients to the dispensary, the in-patient hospital, a farm colony or settlement, or to a sanatorium, etc.

(2) Sanatorium Scheme for treatment of early cases, where pioneer work is done by building up the resisting powers of patients, and creating a desire for fresh air and country life, etc.

(3) Village Colony Scheme for (*a*) reviving village and country life; and (*b*) the provision of garden cities, health or village colonies, industrial settlements, home hospitals for after-care treatment, for treatment in the early stages, and for prevention of tuberculosis.

If tuberculosis is a product of lowered vitality and feeble resisting power, the main line of treatment should be based on improving the health and the well-being of the people. Although this is attempted in the sanatorium scheme, its machinery, its scope, and its resources are limited, and its success is necessarily small. The sanatoria are never intended to work out social and economic problems on a large scale, as the times demand. Therefore, unless the third line of treatment is made a part of the tuberculosis scheme, and developed along broad national lines, we cannot expect any great or permanent success in our campaign against the disease.

The open-air treatment has proved conclusively that the only way to save those who are broken down in life's battle —whether broken in the war or at home—is to place them in the best possible hygienic conditions under the healing influence of fresh air and country life. Already there is a cry for provision of industrial villages for disabled soldiers.[3] In Cambridge, Dr. Varrien-Jones is solving the problem of the consumptive by his village colony scheme.[4] In America, home hospitals for consumptives and those threatened with the disease are proving a success. Ever since 1913 the present writer has been advocating the provision of garden cities and village settlements for India as one of the best means of dealing with tuberculosis on a large scale.[5]

The Indian authorities are inclined to keep to the beaten track, and copy the sanatorium scheme as carried out in England. Just as German measures cannot be slavishly imported into England, so English methods of treatment will not exactly suit India's needs. Sanatoria will not be popular in India, for Indians generally will not leave home or their people to go to such institutions, and so we should bring the sanatorium treatment to their homes. If the development of the third line of treatment is very necessary in England, it is much more essential for the physical and moral welfare of the Indian people. Therefore, as a preventative and curative measure, the first duty of the Government and the social reformers in India should be to make every effort to keep the people in the country by making it attractive and habitable, to revive the village life, and to set up the old home industries in India.

Secondly village colonies should be built somewhat on the lines of garden cities in England, where consumptive patients could go and live with their families, and at the same time carry out the open-air treatment under ideal conditions. These land settlements would be model villages, containing groups of cottages or houses erected on hygienic lines, a hospital, a sanatorium, a school for children, a farm, a dairy, a laundry, temples or places of worship, a public hall for lectures, entertainments, etc. Patients in the early stage of the disease could be treated at home or in the sanatorium, and, if very ill, at the hospital. Suitable patients and other residents, if they wished, would receive technical training, training in agriculture, dairy industry, carpentering, weaving, etc., and the work done would be part of their treatment in graduated exercises; at the same time, it would provide an occupation for the future, and thus solve the after-care problem.

The colony would attract those weak in health or predisposed to tuberculosis, and professional men in search of health. Their children would be taught in the open-air schools. Thus the colony would embrace many activities and become a centre of influence and attraction for miles around. I am sure some such scheme earnestly carried out by various municipalities like Calcutta, Bombay, Madras, etc., with the aid of Government or by private philanthropy, would go a long way, not only to solve the problems of tuberculosis but other social and economic problems which are the despair of other countries.

In conclusion, the Bureau system helps to place the patient on the right road. The sanatorium gives him the preliminary training how to live the right life and increase his resisting powers. The extension of the third part of the scheme on a large, comprehensive scale has been brought within the range of practical politics by the present war.

If such a work is undertaken by men of vision, with enthusiasm and broad outlook as a part of social and national concern, not only for the tuberculous but for the broken-down soldier, the epileptic, the feeble-minded, the neurasthenic, it will bring new life and salvation to millions of people, whether in India or England.

REFERENCES.

[1] *Indian Medical Gazette*, 1912.

[2] For fuller details *see* writer's article in *Modern Review*, April, 1917, Calcutta.

[3] T. H. Mawson's book *An Imperial Obligation*.

[4] *An Appeal for Cambridgeshire Colony*, by Dr. Varrien-Jones.

[5] Paper read at annual meeting by B. M. A. and published in THE PRACTITIONER, 1915.

◆

A CASE OF MIRROR WRITING WITH SOME NOTES ON THE LITERATURE OF THE SUBJECT.

By J. L. M. SYMNS, M.A., M.D. Capt. R.A.M.C. (T.).

The Neurological Section, Royal Victoria Hospital, Netley.

The child came under observation at the age of 6½. She had had a normal childhood, and had begun to walk and talk at 13 months.

She was left handed, and was unable to write except in "the looking glass" manner, as shown in Figure 1.

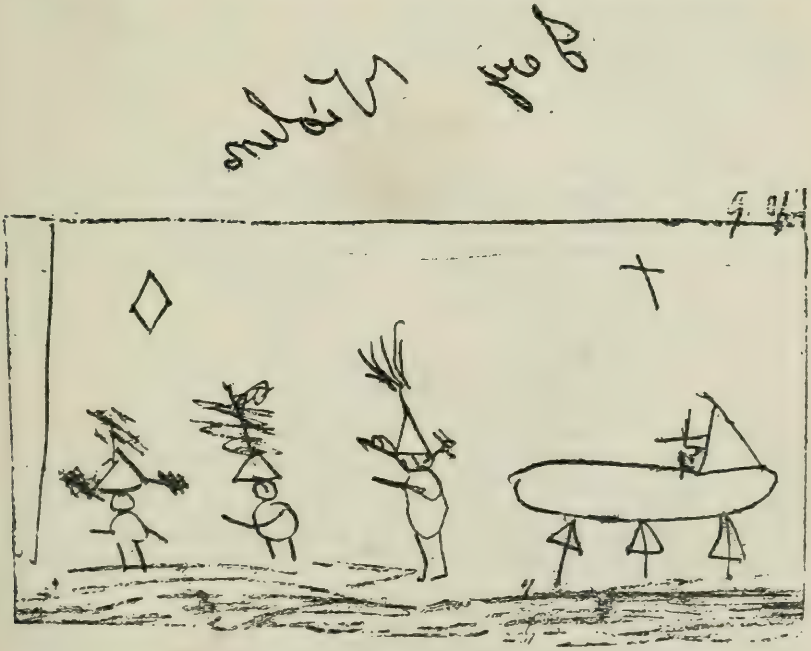


Fig. 1.

On being asked in her Scripture class to draw the story of the "Three Wise Men," she cried bitterly because she was unable to depict them walking towards the manger. Her effort is shown (Figure 1) in which the three figures are walking away from the manger.

She was encouraged by her teacher to use her right hand, and a year later was able to write and draw normally with that hand.

She preferred to use her left hand, and on leaving the infants' school, her teacher began to re-educate her left hand with the result that she now, at the age of nine, draws and writes normally with both hands.

Mirror writing with the left hand has been shown by Lochte[1] to be much more common than is generally supposed. This observer examined the left-hand writing of four schools with the following results :—

(The figures in parenthesis show that there were a number who only partly, in single letters or figures, wrote in mirror fashion with the left hand)

School A (Boys).

Class I.—Among 76 boys - 1 mirror writer.
II.—Among 123 boys - 6 mirror writers
III.—Among 93 boys - 12 (+ 1) mirror writers.
IV.—Among 134 boys - 9 mirror writers.
V.—Among 118 boys - 3 (+ 8) mirror writers.
VI.—Among 114 boys - 13 mirror writers.

School B (Boys).

Class I.—Among 73 boys - 0 mirror writers.
II.—Among 122 boys - 3 (+ 3) mirror writers.
III.—Among 127 boys - 0 (+ 1) mirror writer.
IV.—Among 111 boys - 0 (+ 2) mirror writers.
V.—Among 109 boys - 0 (+ 11) mirror writers.
VI.—Among 67 boys - 1 (+ 7) mirror writers.

School A (Girls).

Class I.—Among 80 girls - 3 mirror writers.
II.—Among 126 girls - 2 (+ 1) mirror writers.
III.—Among 140 girls - 6 mirror writers.
IV.—Among 156 girls - 6 (+ 3) mirror writers.
V.—Among 116 girls - 8 (+ 1) mirror writers.
VI.—Among 53 girls - 2 (+ 8) mirror writers.

School B (Girls).

Class I.—Among 120 girls - 2 (+ 2) mirror writers.
II.—Among 113 girls - 5 (+ 1) mirror writers.
III.—Among 155 girls - 8 (+ 2) mirror writers.
IV.—Among 156 girls - 7 (+ 5) mirror writers.
V.—Among 164 girls - 10 (+ 4) mirror writers.
VI.—Among 108 girls - 31 mirror writers.

Result.

	Per cent.		Per cent.
I.—Boys' Class	0·7	I.—Girls' Class	3·5
II.—Boys' Class	4·9	II.—Girls' Class	3·7
III.—Boys' Class	6·3	III.—Girls' Class	5·4
IV.—Boys' Class	4·5	IV.—Girls' Class	6·7
V.—Boys' Class	9·8	V.—Girls' Class	8·2
VI.—Boys' Class	13·2	VI.—Girls' Class	25·4

The conclusion based on these figures are :—

1. Mirror writing with the left hand is most frequent among the children of the junior classes.
2. Girls are much more likely to be affected than boys.
3. With advancing years normal writing tends to be established.

Ireland[10] had connected left-handedness with the occurrence of mirror writing, but the following figures obtained by Lochte do not appear to substantiate this :—

Left-handed Children.

28 children of Boys' School A - 6 mirror writers.
9 children of Boys' School B - 1 mirror writer.
19 children of Girls' School A - 4 mirror writers.
13 children of Girls' School B - 1 mirror writer.

The occurrence of the condition in adults was studied by Cahen Brach[2] who found that out of 111 women and girls 36, or 32 per cent.,were mirror writers, and out of 121 soldiers 23, or 17 per cent., were mirror writers. Soltmann[3] had stated that individuals suffering from hysteria, chorea, epilepsy, and deaf mutes were specially liable to mirror writing. This statement was opposed by Lochte and Cahen Brach by the following figures :—

Hysteria (after Lochte).

Out of 5 children 1 was a mirror writer with the left hand.
Out of 8 men 4 were mirror writers with the left hand.
Out of 14 women 3 were mirror writers with the left hand

Chorea.

Out of 17 children 0 were mirror writers.

Epilepsy.

Out of 113 men 17 were mirror writers = 13·7 per cent.
Out of 114 women 42 were mirror writers = 36·6 per cent.

Deaf Mutes.

Out of 67 boys 13 were mirror writers = 19 per cent.
Out of 60 girls 23 were mirror writers = 38·3 per cent.

Deaf Mutes (after Cahen Brach).[3]

Out of 77 - 35 per cent. were mirror writers.
Deaf Mutes (after Treitel).[4]—35 per cent. were mirror writers.

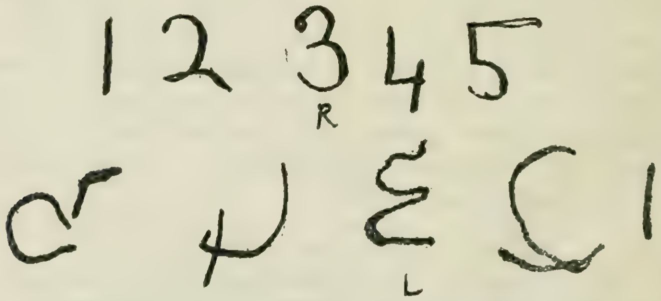
The next investigations were made by Lochte, who examined 200 cases from various neurological clinics. He found the following figures amongst the cases :—

Out of 87 women 38 were mirror writers = 43·6 per cent.
Out of 113 men 22 were mirror writers = 19·4 per cent.

If these statistics are considered, one does not feel justified in agreeing with Soltmann[3] and Cahen Brach[2] that any pathological significance can be attached to the condition, but one would rather tend to agree with Treitel[4] and Buchwald[5] that the occurrence of mirror writing is associated with lack of attention on the part of the writers.

This would account for the fact that it is more common among the younger children in schools.

If an attempt is made to write simultaneously with both hands and the mind is concentrated on the right, one tends to produce looking-glass writing. The following is an example :—



In other words, when the left hand follows the associated movements of the right hand, mirror writing results. Lochte and Weber[6] point out clearly the fact, that the knowledge of writing in the child is generally built up gradually; first, straight lines and then simpler curves, until the movements involved in the more complicated letters are mastered.

Writing is, according to this view, primarily a motor act controlled by the optical image, which is a later development.

Consequently, if the mind and eye are centred on the right hand, we should expect the left hand to follow out the movements of the right hand, and therefore write in mirror fashion.

As the child's intelligence increases, the optical image becomes more forcible and the movements of writing less marked, and we get the frequency of mirror writing decreasing.

Mirror writing is therefore a mirror of the mental development of the child, and in the type of case quoted does not appear to have any pathological significance.

We should consequently expect to find mirror writing very frequently present among the inmates of idiot asylums, and this fact was noted by Pieper[7] and confirmed by Lochte.

The results are arranged according to classes in order of intelligence :—

Pieper.

In Class :
I.—Among 46 children there were 9 mirror writers = 19 per cent.
II.—Among 21 children there were 11 mirror writers = 52 per cent.
III.—Among 24 children there were 12 mirror writers = 50 per cent.
IV.—Among 23 children there were 15 mirror writers = 65 per cent.
V.—Among 35 children there were 24 mirror writers = 69 per cent.

Lochte.

In Class :
I.—Among 10 children there were 2 mirror writers = 20 per cent.
II.—Among 10 children there were 4 mirror writers = 40 per cent.
III.—Among 16 children there were 11 mirror writers = 68 per cent.
IV.—Among 11 children there were 6 mirror writers = 54·5 do.

The frequency of mirror writing among idiot children seems to point to the fact that mirror writing is principally a factor in determining the power of concentration of a child, and has little, if any, pathological importance.

Lochte, Buchwald,[5] Perette[8], and others have reported ases of right hemiplegia, in which mirror writing was a feature, but in this type of case it seems probable that the patient would normally have written in mirror fashion with the left hand, or the lowered intelligence associated with the lesion caused the phenomenon. Many writers[9] have pointed out the fact that injury to the right hand is often the agent and not the cause of mirror writing.

If we consider with Weber that the child learns to write by following the movements of the teacher, it is clear that so long as he uses his right hand to imitate the right hand movements, he will produce normal writing. If, however, he copies the right hand movements of his teacher with his left hand, mirror writing will result. This is well shown by the case quoted in detail by Weber.

The patient at the age of four had suffered from polio-encephalitis. When seen at the age of 34, there was considerable paresis of the right side of the body and face. There was also some paresis of the left leg. There was some contracture of the muscles of the paralysed side, and these were subject to violent choreic movements, which also involved the eye muscles. This man, if given a word to write with his left hand, invariably wrote in mirror fashion, although with frequent glances he copied stroke for stroke the original.

On inquiry, it appears that an attempt was made at his village school to make him use his right hand, but this was naturally impossible owing to the violence of the choreic movement. His teacher then attempted to educate his left hand, but in spite of much trouble he was unable to write normally.

In this case, there is no ground for believing that the habit of writing with the right hand was the cause of mirror writing with the left.

One is forced to the conclusion that the condition is due to the fact that the child copies the movements of his teacher, and thus adopts the abnormal form of writing. In conclusion, it seems probable that mirror writing with the left hand represents the movement by which the child was originally taught. As the details of the optical image fix themselves more firmly in the memory, the predominance of movement falls more and more into the background. We therefore find it decreasing with age, and prevalent in mental defects. The presence of mirror writing in normal adults, such as Leonardo de Vinci, who has left many explanatory notes of his drawings in mirror writing, is probably due to the fact that they chose to write mechanically, following, as it were, the line of least resistance, and did not attempt to correct the sense of movement, although it did not agree with the image that they knew.

REFERENCES.

[1] Lochte: *Archiv. f. Psychiatrie u. Nervenkrankheiten*, XXVIII., 1896, s. 379–410.

[2] Cahen Brach: *Deut. Archiv. f. klin. Medizin*, 1893, p. 148.

[3] Soltmann: *Festschrift zu Henoch's 70 Geburtstag*, Berlin, 1890.

[4] Treitel: *Deut. Zeitschr. f. Nervenheilkunde*, 1893.

[5] Buchwald: *Berliner klin. Wochenschrift.*, 1878.

[6] Weber: *Zeitschrift. für klinische Medizin*, XXVII.

[7] Pieper: *Schriftproben von schwachsonnigen bei idiotischen Kindern*, Berlin, 1893.

[8] Perette: *Berl. klin. Wochenschr.*, 1882, p. 477.

[9] Allen: *Brain*, Vol. XIX., 1896, p. 385.

[10] Ireland: *Brain*, October, 1881.

◆

NOTES ON THREE CASES OF BERI-BERI FOLLOWING RELAPSING FEVER AND DUE TO PROLONGED FEEDING ON CONDENSED MILK.

By KAMEL YACOUB, M.O., E.M.C.

Egyptian Hospital, Kantara.

It is stated by Sir William Osler[1] that beri-beri is commonly met with as a complication in some chronic wasting diseases, particularly tuberculosis and amœbic dysentery. Lt.-Col. Willcox[2] observes, in his report, that many of his cases show a previous toxic illness such as dysentery, chronic diarrhœa, purpura, or jaundice. Whether the frequent and debilitating attacks of such an acute febrile illness as relapsing fever can also in a similar manner prepare the soil for the disease, or not, one cannot venture to say; the fact remains, however, that beri-beri is now universally considered to be a dietetic disease, and due essentially to the deficiency in the food of those nitrogenous substances known as vitamines.

The beri-beri vitamine is naturally destroyed in the process of sterilization and preservation, carried out in preparing all brands of condensed milk.

The three cases to be mentioned were on that diet alone for a period varying from three to five weeks, they had all had relapsing fever previously, and, as they suffered from severe gastric symptoms during and between the attacks, they could not tolerate any other food.

Case 1.—The first case was that of a man, aged 23, who had an attack of relapsing fever with two recurrences, and was on condensed milk for 25 days before the symptoms began to appear. Œdema was seen in both feet, around the ankles and in the lower two-thirds of both legs; and the patient soon became weak, found it difficult to support himself, and suffered from palpitation. The pulse counted 105, and the second pulmonary sound was accentuated, while the knee-jerks were lost on both sides. Examination of the urine showed the absence of albumen, and a specific gravity of 1,027.

After two weeks' symptomatic treatment and change of diet, the patient began slowly to recover, and left the hospital three weeks later unfit for further duty.

CASE 2.—This case was an example of the dry atrophic type of beri-beri, the patient had an attack of relapsing fever with three recurrences, and was on condensed milk for nearly five weeks. The œdema, which was first seen in the lower extremities, disappeared after a few days and gave place to rapid and extreme emaciation; the knee and ankle jerks were early lost, but the sensations remained unaltered throughout. The marked feature in this case, however, was the severe anorexia, so that feeding was very difficult at the end; and the patient lingered for ten weeks before he died, during which the marasmus increased, the muscles atrophied, and the prostration became complete.

CASE 3.—This was the case of a man, aged 30, who had two attacks of relapsing fever and also a septic wound of the leg, and was an example of the acute, pernicious type of the disease.

The patient developed œdema of both legs, and, soon after the abdomen became distended with fluid, he suffered from great breathlessness, the pulse was soft and rapid, the physical signs of hydrothorax and hydropericardium were present, and the patellar reflex was early lost on both sides. This patient was quickly getting from bad to worse; and, after ten days' illness, diarrhœa of a severe, serous, and uncontrollable nature ended the scene.

A post-mortem was made, and fluid was found in the peritoneal, pleural, and pericardial sacs; the subcutaneous tissues of the legs, of the abdominal wall, and over the sternum were sodden with fluid. No lesions were found in the heart, the spleen was firm and indurated, the liver was slightly congested but not cirrhotic, the kidneys were both normal, and the intestines were empty, ballooned, and parchment like.

Besides cases of true beri-beri, cases of extreme emaciation and debility are not uncommonly met with after repeated attacks of relapsing fever; but these need not be confused with the disease, though they may get, later in their illness, slight œdema of the feet, due to weakness of the heart, and retardation of the circulation.

For the permission to publish the above cases, I am indebted to the kindness of Major G. W. Heron, D.S.O., R.A.M.C., A.D.M.S., Egyptian Hospitals.

REFERENCES.

[1] Osler: *System of Medicine, Beri-beri.*
[2] Willcox: Beri-beri, *Lancet*, March 11, 1916.

THE CURE OF SPINAL CONCUSSION IN WARFARE BY SUGGESTION.

By ALAN F. GRIMBLY, B.A., M.B., B.Ch., B.A.O., L.M. Ret. Dub.

The interest in the case described below is twofold, lying partly in the unusual nature of the injury, and in the complete cure effected within 48 hours of the patient's admission to hospital.

J. C., able seaman, aged 23 years, was a member of a gun's crew during an action, in which our own and enemy light forces were concerned. A direct hit was obtained by the enemy on his gun, and all the crew but himself were killed. He was thrown to the deck unwounded, but on regaining his feet an explosion occurred, caused by a torpedo, and he was thrown into the sea. He began to swim, and succeeded in regaining the ship which was still above water, but she sank within a few minutes. He jumped overboard before she went down and began to swim again; a dull explosion took place almost immediately, whereupon he felt a severe pain in his back and lost consciousness. He stated that he thought he heard other men in a similar plight around him cry out just before he became unconscious, but recollected nothing else until he found himself on shore.

On admission to hospital, the patient was fully conscious but quite unable to walk or stand. When placed in bed, he lay towards his right side with the thighs semi-flexed and the shoulders bent forwards. He was quiet, answered questions slowly in a subdued voice, and complained of persistent pain in his back. On examination, great muscular rigidity was found in the lumbar and lower dorsal regions on both sides, together with considerable tenderness on pressure. The pupils were somewhat dilated, and the deep reflexes increased; the pulse was slow and of good tension, and the temperature subnormal.

I decided that a course of suggestion and radiant heat might be of benefit. A radiant heat bath was ordered that night and for the following morning, and I strongly suggested to the patient that he would be quite well on the Friday forenoon, two days from admission. He slept fairly well, and on the Thursday no apparent change had taken place in his condition; he was disinclined to speak, and the pain in his back had not diminished. That evening it was very strongly suggested that he would sleep soundly and wake in the morning with full use of his limbs and freedom from pain. On entering the ward on the Friday morning, I found the patient sitting up in bed anxious to be allowed to get up; he could walk as well as ever, and was absolutely free from pain or stiffness. He was kept under observation for a while, and given ʒi of Easton's syrup three times a day. Very shortly afterwards he left the hospital feeling perfectly fit.

TRIALS OF A SURGEON PIONEER.

BY D. T. BARRY, M.D., F.R.C.S., D.Sc.

THAT sixteenth century surgeons, master as well as neophyte, were frequently influenced by the dread of reprisals in case of ill results from their operative interference admits of little doubt. Perhaps it was a salutary circumstance, conducive to prudence and precision; but on the other hand one might picture a nerve-wrecking effect on sensitive operators resulting in inco-ordination and disaster. What a sensation for a modern surgeon at a base hospital to have such a Damoclean sword suspended above his head, when delving in the complex anatomy of some great leader for the elusive bit of shrapnel! But this is what the famous French pioneer, Ambroise Paré, must have felt occasionally, both as surgeon to the Valois forces in the field and as surgeon to four Valois kings at home. The celebrated writer, Balzac, in his historical work, "Sur Catherine de Medicis," gives an instance of Paré's troubles in each sphere.

The incident chosen from his military career, though not conforming in time and circumstance to the accounts of other accredited historians, is full of interest as indicating the uncertain atmosphere of surgery above referred to; it depicts the manner of infliction and the treatment of the penetrating facial wound from which the notorious François, Duke of Guise,[1] received the sobriquet of Balafré (scarred).

Brantôme, in "La Vie des Grands Capitaines," ascribes the injury to a thrust from a lance received by Guise at the siege of Boulogne in 1545; Balzac with much assurance and authentic display assigns the casualty to the siege of Calais in 1558 (loc. cit. p. 94). Brantôme's account has been generally accepted by subsequent writers. In Paget's well-known English account of Paré's life and work, Boulogne is mentioned as the scene of the occurrence.

Francis of Guise was probably the most renowned general of the sixteenth century. His inordinate ambition was subserved by Promethean energy and indomitable courage. He had designs on the French throne, a family penchant which was sustained throughout a century by all the arts of intrigue and war. His military record is full of astounding success, of which the two predominant events are—his defence of Metz in the famous siege of 1552, and the taking of Calais in 1558.

---

[1] The title of Guise was conferred on his father, the Duke of Lorraine, by King Francis I.

Balzac describes the wound as inflicted by a lance which, entering below the right orbit, traversed the antrum, the naso-pharynx, etc., the point finding exit below and behind the left mastoid. The point of entry, according to Brantôme's account, would be nearer to the inner canthus. The wood of the lance got broken across near its setting in the iron mount (Balzac), and the latter was in the position described when the surgeon came on the scene. "The Duke is not dead, gentlemen," said he, "but he soon will be if I do not act promptly; we have everything to fear, but I mean to take the chance no matter what happens to *me*." He put his left foot on the Duke's chest, stripped off the shattered wood, and pulled out the iron "comme s'il s'agissait d'une chose et non d'un homme." It seems a simple surgical procedure to-day—the average first-aid student would probably be bold enough to withdraw the foreign body immediately—but the bravest surgeon might hesitate if he felt that his own life depended on such fortuitous circumstances as intact venous sinuses and arteries in a wound of this sort. Paré's account of the situation, some time later, in words attributed to him by Balzac, gives a good idea of his feelings: "Je courais la chance d'être echarpé par tous ses amis."

At the siege of Boulogne, the military prowess of Guise was still almost an unknown quantity; the above description of the surgeon's danger, supposing it to be true, would have been clearly an exaggeration had this been the scene of the trouble. Historians like Dareste, Michelet, etc., assign no place of importance to Guise at the siege of Boulogne, so it is improbable that the surgeon, though he had as yet achieved but a small portion of the fame which subsequently became his, should have here run much personal risk through failure. At Calais, on the other hand, such fame would not necessarily have shielded him from summary reprisals for mischance when it concerned the popular idol, the man of Metz.

Of the many interesting events in the life of Paré, of surgical, political, and religious aspect, there was none, perhaps, wherein all three attributes were more significant than in the circumstances attending the illness of the young king, Francis II., in 1560. At the instigation of Guise, the Prince of Condé, leader of the Huguenots, was condemned to death for treason and heresy at Orleans. He had many sympathizers in the town, and serious demonstrations or actual revolt being feared, the King, pending the execution, took a trip on the Loire. He contracted a chill, and severe pain in his ears portended the rapid onset of *otitis media.* Quickly conveyed to his bed, he showed alarming symptoms which exercised the diagnostic powers of the numerous medical men summoned in consultation. Paré in his usual confident manner expressed the opinion that certain humours had collected within the skull (*qu'un dépôt s'était formé à la tête du roi*) to which issue should be given by trephining. All his confrères, except Chapelain, the King's physician, disagreed. But Ambroise was not to be turned aside by such opposition; he felt that he knew best, and decided to operate on the following morning. He proceeded to his home where, as represented in Balzac's story, he was practising with his trephine on a recently disinterred skull when visited at night by the Court furrier, Lecamus. This merchant had provided Paré with the necessary money to pursue his studies. The furrier was anxious for the safety of his son, arrested with Condé, and this was vouched for by the Italian Ruggieri, the astrologer, on condition that the father would dissuade Paré from saving the life of Francis II.

Though he never declared his allegiance to it, Paré exhibited a tendency to embrace Calvinism, and it is more than hinted by Balzac that appeals were made to him on this score to display a little less ardour in his treatment of the King. Guise, the most implacable foe of the Calvinists, was virtually king while the weakling, Francis II., lived; the latter was married to Guise's niece, Mary Stuart (Queen of Scots), and the pair were but puppets in the hands of the wily uncle. Paré stood high in the favour of Guise, to whom the success of the operation meant everything. It is further suggested by Balzac that Ruggieri, in the negotiations mentioned, was but the emissary of Catherine de Medicis, who desired the death of her son. The apparent motive of Catherine, the desire for the regency involved in the accession of the next son Charles IX., obscures all credit which might be given her in opposing the operation from genuine dread of the horrible innovation of trephining. It was this temporizing of the futile assembly of lay and medical consultants, over which the surgeon had no control, that prolonged the agony until the sufferer grew moribund, and stifled the opportunity of surgery.

Dumas ("Chicot the Jester," p. 152) suggests that the illness of Francis II. was not natural. "At least, I have heard it said that this mortal malady was poured into his ear by someone well known," thus the younger Guise to the Duke of Anjou in Dumas' sketch. Dumas also advances the theory that Charles IX. was the victim of poison, sprinkled on the leaves of a hunting book, in thumbing which he conveyed it to his mouth. The pouring of the mortal malady into his ear recalls the account of the Ghost in Hamlet, into whose ear was poured the "juice of cursed hebenon,'" which courses "swift as quicksilver" and . . . "doth posset . . . the thin and wholesome blood." The idea of congealed blood was associated with the paralytic condition, the mainspring of muscle activity being the thin wholesome state. Dumas gives no such detailed account of the nature or action of his aural poison. It is difficult to imagine how the mortal malady was poured in and of what it consisted. The direct passage to the middle ear, were it known to such a scribe as Dumas, could not have been chosen for the poison; it would have been preposterous for a murderer to go playing with the Eustachian tube. Yet it would be as feasible an idea as the finding of a sixteenth century streptococcus culture and pouring it into the external auditory meatus, with a view to setting up otitis after the breakdown of the membraneous obstacle to entry.

Chief interest from the surgical point of view lies in the obstacles which the story reveals as besetting the path of the votaries of the incipient science. The transition from the barbarous to the scientific was marked by vexatious incidents for the leaders. But the subtlest germs loosed in the agency of side-tracking from the straight line of duty proved innocuous to such minds as Paré's, whose triumphs involve a debt of gratitude from humanity for the evolution of modern surgery. For such pioneers, tribulation was but an incentive to the exercise of greater care—forerunner of that sense of responsibility and foresight which characterize our surgeons of to-day.

Practical Notes.

TREATMENT OF PAPILLOMATA AND INGROWING TOE-NAIL WITH FORMALDEHYDE.

Suldey describes a simple method for the treatment of papillomata and ingrowing toe-nail, which gives excellent results. For papillomata, especially venereal warts, an application is made once each day, in the evening for choice, of the ordinary solution of formaldehyde, formol, by means of a small swab of wool, preferably on a holder. This is well soaked in the formol, and then each growth is touched on the surface. Cure depends on the size and number present, but may be expected in from four days to a fortnight. The surface of the wart becomes gradually blanched, and after the third day, the dead layers of tissue begin to get detached, to be followed shortly by complete disappearance of the growth. The application is painless and very easily borne. It only gives rise to a slight irritation, which passes off in two or three minutes. The formol must not be allowed to touch the healthy mucous membrane, although no serious result follows should this occur. If there is a large collection of these growths, it is advisable to deal with them in successive areas. When all have fallen off, a small superficial ulcer is sometimes left. This quickly heals by applying some drying powder—bismuth, talc, oxide of zinc, etc. Relapses have never yet been seen to occur.

For ingrowing toe-nail, the technique is practically on the same lines. The granulations are touched with the swab all over the seat of the lesion, and a thin layer of liquid is allowed to spread under edge of the affected nail. This is repeated daily. The pain stops almost at once, all inflammation subsides, and recovery is complete, on the average, in four or five days. Relapse of the condition is best prevented by avoiding the cause of the trouble.—(*Journ. de Méd. et de Chir. prat.*, December 10, 1917.)

TREATMENT OF ASTHMA.

Delthil makes use of four drugs in his treatment of asthma—benzoate of lithia, iodide of potash, oil of Haarlem, and colchicum. Lithia is an active base, combining readily with uric acid to form a soluble compound, which is easily eliminated. The use of the benzoate may be continued for years without ill effects, or it may be replaced by the salicylate. Iodide of potash is the drug for choice in the treatment of asthma, but, unfortunately, it cannot often be tolerated. One gramme doses should be given daily as a preventive, and two grammes during an attack. It may sometimes be replaced by peptonized iodine. Oil of Haarlem is a pyrogenous product from juniper wood, a congener of oil of cade. It acts usefully on the liver and kidneys, and good results are obtained from a prolonged use. It should be given in capsules at bedtime, from 2 to 4 for a dose, each containing 5 drops of oil. Colchicum is given as tincture of the seeds, in a daily dose of from 1 to 3 gr. With these four drugs Delthil sometimes combines others to increase their action, or protect from functional disturbance. Opium promotes tolerance of iodide of potash. Injections of morphia are useful in a severe attack, and the tinctures of lobelia and stramonium may be used to add to the tonic effect of opium on the heart.

Delthil prescribes the drugs in the following way. Benzoate of lithia, in a dose of 1 g. each day, is given in two cachets, one in the course of each of the principal meals. Every evening at bedtime, and not less than one hour and a half after a meal, the patient takes a tablespoonful of a syrup containing extract of opium, digitalis, colchicum, and iodide of potash. The iodide is given in a daily dose of from 1 to 1·50 g., and when it is not well borne, the dose of the pure drug should be made up into four sugar-plums well coated with sugar, which are taken with the dose of syrup made without the iodide. In this way, contact with the buccal mucous membrane is prevented. During an attack of asthma, the dose of syrup is increased to one-and-a-half tablespoonfuls, and eating meat is forbidden. The capsules of juniper oil are taken at the same time as the syrup.

The constituents of the syrup are in such amount that the iodide is the chief ingredient. The preparation has a laxative and active diuretic action, stimulates the general circulation, and loosens the bronchial secretion. With the object of increasing the diuretic effect, Delthil orders a cachet, containing theobromine, caffein, and sparteine sulphate every morning on waking for a period of three weeks, when the urine is small in quantity and uræmia symptoms threaten.—(*Journ. de Méd. et de Chir. prat.*, January 10, 1918.)

A MODIFICATION OF RECLUS'S OINTMENT.

Pied has suggested considerable alterations in this well-known preparation, and eliminates all the harmful constituents, in accordance with the teaching of Brocq. It is claimed for the new preparation that it is quite unirritating, soothing, and that it promotes healing. The formula is :—

Glacial carbolic acid.	
Salicylic acid - - - -	of each 1 g.
Resorcin - - - - - -	2 g.
Camphor (powdered).	
Phenazone - - - -	of each 5 g.
Balsam of Peru - - - - -	6 g.
Paraffinum mollis - - - -	to 100 g.

The carbolic acid, salicylic acid, resorcin, and camphor, should be dissolved in a small quantity of alcohol. The phenazone is dissolved in its own weight of sterile water. The mixture is incorporated with the vaseline, and the Balsam of Peru thoroughly mixed with it in a mortar.—(*Journ. de Méd. et de Chir. prat.*, January 10, 1918.)

Reviews of Books.

Tropical Diseases. By Sir Patrick Manson, G.C.M.G., M.D., LL.D., Sixth edition. Pp. xxii + 968. London : Cassell and Company. 16s. net.

This new edition of Manson's "Tropical Diseases" has appeared at an opportune moment, for numbers of cases of tropical affections are now reaching this country from the various eastern seats of war. For the medical officer who has to deal with them, we know of no better guide as regards either diagnosis or treatment than this book. The present edition has been revised throughout and brought up to date. Leiper's researches on bilharzia have been included, and the chapter on the various "insect" carriers of tropical parasites has been revised by Lieut.-Col. Alcock. Rat-bite disease is now included among the fevers, which must be regarded as its proper place; it might have been extended with advantage in view of the amount of work which has of late been done respecting it. The account of verruga is similarly somewhat lacking. Pellagra is now relegated to the section dealing with diseases of undetermined nature, and a good summary is given of the various hypotheses as to its causation. The section on the diagnosis of undulant fever by the agglutination reaction requires more up-to-date details, and that on the vaccine treatment of this disease is insufficient; for instance, no mention is made of dosage. Two of the best chapters are probably those on malaria and trypanosomiasis. The book is illustrated with numbers of excellent plates and figures, some coloured, which enhance the value of the work.

What every Masseuse should Know: Comfortable Grasps for Joint Movements. By Vera Waddington, with prefatory notes by Sir Rickman Godlee, K.C.V.O., and Mrs. Annie E. Stewart. and an introduction by Laura M. Fairbairn. Pp. 105. Illustrated. London : Methuen & Co. 2s. 6d. net.

This little book consists in the main of 47 clever sketches with descriptive letter press. The inclusion of the short glossary indicates that it is intended to assist students during the most elementary stages of their training. We welcome the production in so far as it may serve to impress on the student that movement is the inseparable complement of massage, but we cannot help regretting that many of the illustrations could not have been made to show a better technique. For instance, passive movement of the foot is figured with the knee in full extension, and two positions chosen to illustrate movement of the knee are unnecessarily clumsy, while one of the best —with the patient prone—is omitted. In dealing with movement of the upper extremity many of the grips shown could be much improved, and the desirability for extension of the wrist as a preliminary to several of the movements should be emphasized.

To medical men the book will prove of little interest ; the massage student should not accept the grips shown unreservedly, but can secure many a useful exercise by practising the grips as illustrated, and working out improvements thereon.

Experimental Pharmacology. By DENNIS E. JACKSON, Ph.D., M.D., Associate Professor of Pharmacology, Washington University Medical School, St. Louis. Pp. 536. London: Henry Kimpton. 20s. net.

THIS imposing manual is a laboratory handbook, but in a much more restricted sense than is usually the case. The title is strictly correct, inasmuch as the treatise is only experimental, but the pharmacological results of the experiments must be sought elsewhere. A less misleading title would have been "Pharmacological Laboratory Apparatus and Methods." From the preface it is clear the author had it in his mind to produce for teachers and students of pharmacology an analogous work to Faraday's "Chemical Manipulation," and other similar chemical works. In discussing the title we have fairly well indicated the character of the book. It is one which will be most highly valued by teachers of this branch of medicine, because there has been nothing quite like it before, and because it is the outcome of Professor Jackson's own teaching labours; it, therefore, is full of the most useful instructions and practical hints in the fitting up and operating the intricate apparatus of a pharmacological laboratory. The author has some pertinent remarks upon the best way to arrange classes of students, and to assign the work to them so as to obtain a maximum of manipulative work and of information for the whole class. His ideas may not always commend themselves to English teachers, but they cannot fail to make the receptive reader appreciate the fact that it is possible that more good than harm will result from knowing something about American teaching methods. The book is divided into two parts.

The first part comprises an introductory chapter on apparatus, and then follow 168 "experiments" dealing chiefly with the particulars of apparatus, dissection, manipulation, and recording of results in connection with all the chief organic and inorganic drugs. The directions for carrying out the necessary dissections are given with a wealth of detail and illustration as to be beyond the needs of the average student, but we have no doubt that lecturers and demonstrators will be thankful for them. There are 390 original illustrations and 24 full-page coloured plates. All the drawings are of such a size and so clearly made as to present the objects without any possibility of confusion; those showing the relationships of the different pieces of apparatus are particularly well done, and should prove very useful. The second part of the book treats of "shop work," that is, with the making of the mechanical appliances for the laboratory, the glass blowing, etc., and it also gives particulars of photographic equipment and methods.

The book is a most valuable adjunct to the ordinary text-books on pharmacology, and will become indispensable when this subject is more thoroughly taught experimentally in the laboratory. At present it is impossible to make such good use of it in this country as in the United States, because of the regulations which restrict experimentation on animals.

THE PRACTITIONER.

APRIL, 1918.

THE PREVENTION AND TREATMENT OF HÆMORRHAGE IN ENUCLEATION OF TONSILS.

By WILLIAM HILL, B.Sc., M.D.

Surgeon for Diseases of the Throat, Nose and Ear to St. Mary's Hospital, London; Honorary Consulting Specialist to the London Military Hospitals, etc.

In connection with enucleation of the tonsils by the usual guillotine method under short anæsthesia, the hæmorrhage is generally smart for a minute or two, but tends to be no more than mere oozing in the course of from three to five minutes, without the adoption of any special measures beyond sponging the face with cold water or syringing the fauces with ice-cold water. In a certain small proportion of cases, however, the hæmorrhage is not merely immediately severe, but continues to be so profuse as to give real cause for alarm. The cases which the specialist is more usually asked to deal with, however, are those in which it is stated that the excessive primary bleeding apparently ceased at the time of the operation, but recurred at a later period varying from a few hours to a few days. The hæmorrhage in some of these cases may, in exceptional instances, be so severe as to try the resources of the surgeon to the utmost.

Secondary hæmorrhage is usually classified as: (1) early secondary or reactionary hæmorrhage, which occurs during the first 30 hours, usually five or six hours after operation; and (2) late, or true, secondary, which takes place from the fourth to the seventh day at the time of the separation of the sloughs. In the recurrent form (3) two or more distinct hæmorrhages occur during the week or so following operation. The most serious cases of post-operative bleeding, with which we have to deal, are said to be of the early secondary or reactionary type, and come on a few hours after operation, not infrequently late in the evening or during the night. Some of these cases, however, are not really instances of reactionary hæmorrhage, but of moderately continuous primary bleeding which has been overlooked; owing to the patient lying on his back, the blood passes into the stomach, and is brought to notice either by a sudden exacerbation, through the patient fainting, or the vomiting of a large quantity of fresh blood. After operation, the patient should lie in the semi-prone position with the occiput supported, and the mouth low to avoid overlooking latent or hidden bleeding.

The division into venous and arterial hæmorrhage is of little moment, but by some much importance is attached to ascertaining whether the bleeding is from one or two vessels only, or is of the nature of a widespread oozing from the whole tonsillar bed; the latter condition is probably much rarer than is popularly held by practitioners. Accurate search usually reveals a bleeding point or points.

The question of the prevention and treatment of excessive bleeding in connection with removal of the tonsils may be considered most conveniently under the following heads:—

1. Selection of suitable cases and exclusion of, or the taking of special precautions in, those exceptional cases which are likely to present dangerous complications.
2. Prophylactic measures.
3. The selection of those methods of operating in which the primary bleeding can·not merely be reduced, but easily controlled and effectually dealt with at the time of operation, before the patient has left the operating table.
4. The treatment of secondary hæhmorrhage.

THE SELECTION OF CASES AND EXCLUSION OF UNSUITABLE ONES.

One will naturally avoid operating on subjects with enlarged tonsils who are actually suffering from acute tonsillitis, more especially if complicated by quinsy (peritonsillar abscess) or in the course of exanthematous fevers, diphtheria, secondary syphilis, etc. Operation in such conditions is only justifiable when the swelling is so great as to occlude the fauces and seriously interfere with alimentation and respiration. I have, however, twice operated in such circumstances without mishap. Speaking generally, operation should be postponed in all septic conditions of the mouth fauces, and pharynx. In reference to quinsy, it is interesting to note that Fitzwilliams has advised excision of the tonsil at the time, as the most satisfactory way of immediately evacuating the whole peri-tonsillar space and thus avoiding the tedious drainage following a palatal incision which sometimes tends to close too early. This practice is, however, rarely followed.

Careful inspection of the fauces should be made before deciding on operation, in order to detect the presence of either an enlarged tortuous external carotid or ascending pharyngeal artery. The very evident pulsation is sufficiently obvious. Gross angiomatous conditions of the fauces are usually considered contra-indications. Hereditary hæmophilics and other "bleeders" should only be operated on when the necessity is urgent, and then only after special precautions to be mentioned later.

Cases of nephritis and of heart disease, especially when there is high tension, must each be considered on its merits.

Unfortunately, it is rarely possible to diagnose cases of enlarged thymus and the subjects of status lymphaticus until alarming and usually fatal complications ensue when the patient is under the anæsthetic. Operation should certainly be postponed in very anæmic and debilitated subjects; but when there is deafness from middle ear disease, the adenoids only may be dealt with, and the tonsils at a later period when the general health has improved.

Patients should not be operated on for choice, either when menstruating or immediately before, for there seem to be good grounds for the view that the tendency to both primary and reactionary hæmorrhage is increased at these periods.

PROPHYLACTIC MEASURES.

Although "bleeders" are, speaking generally, best left alone, yet in some cases there may be urgent reasons for reducing the tonsils, and in such subjects both Graham and I have each, in one instance, succeeded in decreasing the coagulation-time of the blood, by horse serum, before operating. This is made up in 10 and 25 cc. glass ampoules, and is administered by the mouth thrice daily for from two to eight weeks. The coagulation-time should be taken every few days. In Graham's case of a bad bleeder, the coagulation-time was at first 15 minutes, and was reduced in eight weeks to something under five minutes, when enucleation was performed with Elphick's hæmostatic guillotine, and only a few drachms of blood were lost. In my case, a boy of 10, in spite of a definite history of bleeding, the coagulation-time was found to be not more than five minutes. This was reduced to 2½ minutes by the administration of 10 cc. of horse serum, twice daily, for three weeks. Graham gave the larger dose thrice daily, because his patient was an adolescent. In my case also, Elphick's guillotine was used, and the bleeding was very moderate, probably not more than two ounces were lost, and it was easily controlled and stopped by pressure.

Coagulose, a soluble powder prepared from horse serum and containing the essential fibrinogenous elements, is much used and highly spoken of in America for the same purpose.

In anæmic subjects, who are likewise delicate, it is advisable to administer a prophylactic course of iron or arsenic, together with climatic treatment if feasible.

CHOICE OF OPERATIVE METHOD.

Most tonsils are enucleated in this country, more especially in throat and ear clinics, under short anæsthesia, such as ethyl chloride or nitrous oxide gas, and by means of the "reverse guillotine" technique of Whillis. This cannot be described as a hæmostatic method, and should not be chosen in anæmic and other subjects in whom excessive bleeding may be anticipated, and for whom it is our duty to take special measures, such as the use of the hæmostatic guillotine.

It is true that many thousands of tonsils are enucleated yearly by the guillotine method under short anæsthesia, and that serious trouble from hæmorrhage, whether immediate or remote, is, on the whole, rare, and fatalities are rarer still; but undoubtedly these unfortunate incidents do occur.

In the short anæsthesia and guillotine method, the bleeding is frequently sharp for a minute or two, but, as a rule, it speedily subsides on cold sponging of the face; syringing the fauces with ice-cold water is more efficient still. When cold fails, syringing with hot water at the hæmostatic temperature often succeeds. Should these methods prove ineffectual, the same measures, to be described later, for dealing with secondary hæmorrhage will be found equally suitable for arresting primary operative bleeding.

On the Continent and in America, enucleation, whether by guillotine or by dissection methods, is frequently performed under local anæsthesia; a solution of either cocaine or eucaine, together with adrenalin, is injected in each case.

In this country, the method has been advocated and practised by Horgan, of Cork, who injects this anæsthetic and hæmostatic solution just below the mucosa by four or five insertions of the needle round the margo tonsillaris, so as to raise up an elliptical collar round the tonsil. As the injection is very superficial, its anæsthetic and hæmostatic sequelæ are likewise limited, and the method often leaves a good deal to be desired from both points of view; in fact, it does not reach the vessels in the deepest part of the tonsillar bed, and in many instances as much blood is lost as in the guillotine operation under ethyl chloride anæsthesia. It is, therefore, unreliable as a hæmostatic method, and is not a success in children from the anæsthetic point of view, and, should serious immediate bleeding ensue, it is as difficult to deal with, especially in children, as under short general anæsthesia, and possesses none of the advantages of operation under prolonged deep anæsthesia.

To ensure, then, the stoppage of all bleeding when the operation is completed and whilst the patient is still on the table, prolonged and fairly deep anæsthesia is necessary, and this should be the method of choice in all cases in which trouble is anticipated. Such cases are best done in hospital or in a nursing home. Many specialists prefer to operate on all private cases, when time is not such an object as in the out-patient clinic, under prolonged general anæsthesia; the latter is not essential in the guillotine operation, when short anæsthesia is sufficient, but is absolutely necessary when enucleation by partial or complete dissection is carried out.

To sum up this aspect of the subject, in enucleation of the tonsil complete in its capsule, by whatever technique, prolonged and fairly deep anæsthesia is necessary, if all bleeding is to be stopped at the time of operation, and the tonsillar beds left quite dry when the patient is about to be removed from the operating table.

A longer and deeper anæsthesia is required in dissection methods than in others, and many operators insist on open ether throughout, on the ground of its greater safety when the anæsthesia is so deep as to abolish the faucial reflexes. A preliminary hypodermic injection of atropine ($\frac{1}{100}$ gr.) should be given in children, more especially when ether is administered, and atropine and morphia in adolescents and adults. Some anæsthetists first get their patients well under with ether and then keep them under with chloroform, but giving ether from time to time if there are special indications for discontinuing the chloroform. Others compromise by administering the C.E. mixture.

Not too deep a chloroform anæsthesia is sufficient in hæmostatic guillotine methods, and is preferred by many, in spite of its being more dangerous, from the fact that it does not induce so much congestion and consequent bleeding as ether. Deep and prolonged chloroform anæsthesia is too dangerous to be justifiable. Improved methods for the *prolonged* administration of gas and oxygen, a comparatively safe form of anæsthesia, have recently been introduced into this country from America, but, as far as I can gather, it has not been adapted sufficiently as yet to cases of tonsil dissection.

There are several methods of enucleating tonsils with *hæmostatic technique under prolonged general anæsthesia*, which insure a dry condition of the tonsillar beds at the time the patient is removed from the table:—

1. The snare (wire loop) method.
2. The hæmostatic-guillotine method.
3. The combined guillotine and snare method.
4. The method by dissection throughout.
5. The method by preliminary sub-total dissection and completion of the enucleation with the snare.

Of these, the use of the snare alone is the simplest and usually the most hæmostatic of any method, but unfortunately it is not of universal application, being only suitable for pedunculated tonsils; that is, those in which the projecting portion of the tonsil is much larger than the embedded portion, and in which there have been no previous operation and no attacks of tonsillitis or of quinsy to cause firm cicatricial adhesions of the capsule and pillars with the deeper portions of the tonsillar bed. In suitable cases the snare method is, I think, the operation of choice, and it finds its most useful field of application in younger children.

The method of dissection, in combination or not with the snare, is probably the least hæmostatic one; that is to say, there is more bleeding during the actual operation than is experienced in the other methods mentioned above, though this bleeding in the tonsillar bed can be and must be controlled and stopped before the patient leaves the table. This method is by far the best in the sense that in skilled hands *the tonsil can be enucleated complete with absolute certainty,* and the accessory faucial tonsil or lingual extension can be removed at the same time; it is more especially indicated in cases in which there are cicatricial adhesions between the capsule and its bed, as is the case after previous attempts at removal and after attacks of quinsy. It is the operation of choice in most adults, in whom the connections of the capsule with its bed are tougher than in children. It is also the most certain method of removing those buried and small diseased tonsils, whether in the adult or in the young, which are not always easily dealt with, even by experts, by means of the guillotine.

Holding these views, I find myself at variance with the dictum of so acknowledged an authority as Dan McKenzie, who lays it down, and in italics, that "*a child's tonsils should never be dissected out.*" It may be pointed out that the dissection method of Waugh was brought out and perfected by him at the Children's Hospital, Great Ormond Street, and is the routine method employed there, at University College, and at some other hospitals, and is done under deep ether or chloroform anæsthesia. While, however, I think McKenzie's pronouncement is too absolute, I am in general agreement with him that enucleation with the guillotine is the more generally suitable routine method for children; for operations under short anæsthesia, *e.g.*, ethyl chloride, it is now the acknowledged method of choice in throat and ear out-patient clinics, where a number of consecutive operations have to be carried out.

APPLIED ANATOMY OF THE FAUCIAL TONSIL AND OF ITS BED.

The faucial or palatal tonsils are specialized lymph glands, amygdaloid in shape, made up of numerous closed follicles, and lying on the banks of the alimentary canal; they are partly embedded in the tonsillar beds and partly not, presenting a free, convex, semi-elliptical surface in the fauces covered by a thin mucosa. The bed for the tonsil is a large scaphoid depression, situated on each side of the fauces between the pillars; it is formed of muscular tissue, together with a superficial layer of fascia, and is limited laterally and marginally above by the palatoglossus and palatopharyngeus, and more deeply by the superior constrictor which forms the floor of the bed. The muscular layer of the bed is covered by a layer of loose areolar tissue, being the deepest part of the pharyngeal fascia, a derivative of

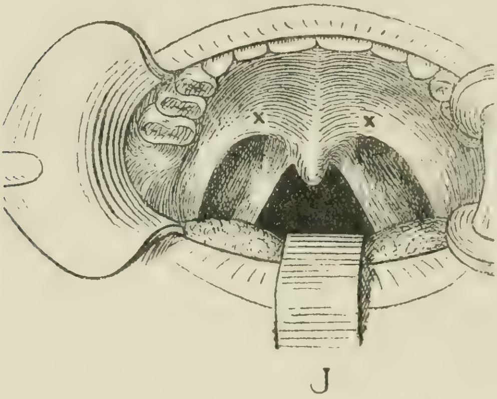


FIG. 1.—*Diagram by Leslie Davis (U.S.A.), showing the exposed portion of the tonsil bed.* x *is over the hidden dome of the bed.*

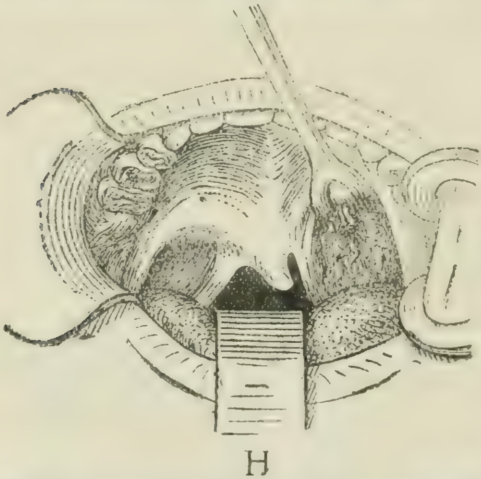


FIG. 2.—*The upper portion of the bed with artery and veins from the descending palatine vessels exposed by a retractor (Leslie Davis).*

the deep cervical fascia. The bed is pierced by numerous arteries, veins, lymphatics, and nerves, which pass between the bed and the capsule of the tonsil which they pierce. The bed is deep and dome-shaped above, where it forms a cave in the palate and serves to conceal the upper pole of the tonsil; the sides of the bed shelve below to join the level of the floor at the extreme lower end, where the lower pole is left largely non-embedded.

Many American writers refer to the tonsillar bed as the "sinus tonsillaris," but this term should be applied only to the embryonic structure in which the tonsil is developed, and otherwise known as the palatal or tonsillar recess, or the tonsillar fossa. The vestige of this embryonic structure is to to be found in the *crypta magna* of Hardie Neil, and named the supra-tonsillar fossa by Paterson; as, however, this fossa or large crypt is wholly intracapsular, Paterson's terminology is unfortunate. If a colourless non-committal term is considered desirable, instead of crypta magna I suggest that it might be named the *ventricle* of the tonsil. What I wish to emphasize is, that the embryonic terms sinus tonsillaris and tonsillar fossa should neither of them be considered appropriate for applying to the tonsillar bed, which is of itself sufficiently exact an expression.

Two-thirds of the faucial tonsil are enclosed in a cauldron-shaped capsule. This structure not only limits and covers the embedded portion of the parenchyma, but it also extends as an annular plica on to the free surface of the tonsil; the plica there presents an elliptical free margin, bounding and encircling the crypt-riddled, mucosa-covered parenchyma. This non-embedded, mucosa-covered portion of the capsule—the annular plica—does not exist as a regular riband of uniform width, but is wide and prominent below, where it forms a falciform suspensory sling for the parenchyma of the lower pole—the plica triangularis—and is more prominent in front and below; a less wide portion of the plica is situated above in the upper quadrant—the plica semilunaris—and its free concave border reaches down nearly to the wide mouth of the crypta magna; where the anterior and posterior cornua of the semilunar and triangular folds join one another, the annular plica is comparatively narrow. On inspecting the tonsillar region, all that one sees in many instances is the lower triangular or falciform segment of the plica; if, however, traction is made with a vulsella, not only does the upper or semilunar segment become evident, but the annular form of the plica, as first described by Leslie Davis (U.S.A.), is clearly demonstrable. The plica consists, then, of the non-embedded free portion of the capsule covered by mucosa.

The elliptical line of junction of the free and the embedded portions of the tonsil is a landmark of first-rate surgical importance. It also corresponds to the line of junction of the free and embedded portions of the capsule, and to the line of junction of the mucosa covering the annular tonsillar plica and that covering the adjacent mucosa of the palate above, the faucial pillars laterally, and of the side of the pharynx below. This line of junction may be appropriately named the *margo circumtonsillaris*, and is henceforth in this article usually alluded to as the *margo*, for short. This margo marks the line of severance of the mucosa, which is an essential procedure common to all properly performed methods of tonsil enucleation, whether the severance is made by means of a wire loop, a guillotine blade, or a sharp or blunt dissector. When the margo is torn through, or incised by any method, we come down to the exposed, shining, fibrous capsule of the tonsil, and are at the threshold of the so-called subtonsillar space. There is an imaginary and not even a potential space, but really a mere plane between the superficial specialized layer of pharyngeal fascia (the tonsillar capsule), and the adjacent, subtonsillar, loose areolar tissue

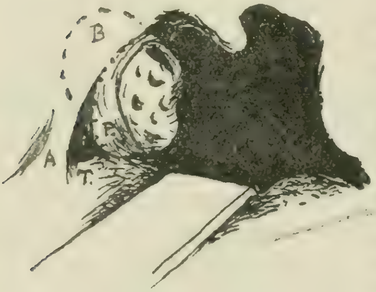


FIG. 3.—*Antero-lateral view of the fauces.* A. *Anterior pillar.* P. *Anterior aspect of the well-developed annular plica. It will be seen that the anterior pillar and plica are adjacent above, but are separated by a triangular interspace at the side of the pharynx below near* T, *the depressed tongue. Below the edge of the upper semilunar part of the plica is seen the crypta magna; and above that the true supra-tonsillar fossa. The dotted line shows the anterior part of the margo circumtonsillaris. The interrupted line* B *indicates the limits of submerged portion of the tonsil in its bed.*

covering the muscular layer of the tonsil bed.

When pus accumulates in the subtonsillar areolar plane, as in quinsy, we get an actual subtonsillar space. It is the looseness of this areolar layer that enables the tonsil to be subluxated half out of its bed, when traction is made with a vulsella; but after a former quinsy this movement is much restricted by subsequent adhesive changes, rendering enucleation difficult except by dissection.

This plane between the capsule and the subcapsular areolar tissue is the plane of passage of the wire of the snare, of the blunt enucleating guillotine blade, and of the blunt dissector in all hæmostatic and other methods of enucleation.

The vessels, which pass through the bed into the tonsil, form far firmer connecting strands than the loose areolar tissue lying between the muscular bed and the capsule; this can readily be made out during enucleation by dissection of simple hypertrophied tonsils in children, in whom there has been no previous inflammation. These vessels should be severed by crushing or by lateral force rather than by cutting, in all methods of enucleation in which a feature is made of hæmostasis.

The Vascular Supply.—The exact sources and distribution of the tonsillar vessels are of academic rather than of practical interest, for bleeding points in the tonsillar bed necessarily have to be secured *in situ* wherever found without any reference to their outside source and connections, it being unnecessary to tie vessels in their course before they reach the tonsillar bed. The recommendation in various text-books to tie the external and even the common carotid, to say nothing of the main trunks of the facial and ascending pharyngeal vessels, by a cervical incision, in exceptional cases of serious hæmorrhage, is not one in accordance with the practice of those who really understand this subject. What is of some practical importance, however, is to know the sites of predilection of tonsillar hæmorrhage in the tonsillar bed. These are at least five in number, viz. :—

(1) About the centre of the bed, where the larger branch or branches of the main tonsillar artery perforate the bed.

(2) In the region of the upper third of the bed, where a

branch of the descending palatine artery and vein sometimes cause trouble and require ligaturing; a procedure which is facilitated by using a tractor (Leslie Davis) to draw up the overhanging supratonsillar fold of the palate.

(3 and 4) Vessels along the posterior surface of the anterior and along the anterior surface of the posterior pillars; and

(5) In the lower third of the tonsil, where, in addition to an artery or arteries, a plexus of veins occasionally gives rise to a good deal of trouble until clamped and subsequently ligatured.

When clumsy methods of enucleation, especially by dissection, cause wounds in the muscular pillars or in the superior constrictor, fresh sources of bleeding are opened up where the vessels are larger in calibre. When the constrictor is perforated, the main tonsillar artery or the ascending pharyngeal may be wounded.

THE WIRE LOOP SNARE HÆMOSTATIC OPERATION.

As before mentioned, this method is more especially suited to pedunculated, tonsils in children. Some tonsils, which do not look pedunculated, can be made to assume a pedunculated form when traction is made with a vulsella.

When performed under a short anæsthetic, the operation has to be executed too rapidly to ensure hæmostasis, so that open ether, chloroform, or a mixture is indicated. A vulsella and suitable tonsil snare, *e.g.*, Eve's or Beck's, are all the instruments really necessary, but I think Sargnon's technique is better. He employs two vulsellæ, viz., one to seize the tonsil about the middle and subluxate it somewhat out of its bed towards the midline of the fauces, and a second vulsella with spoon-ended jaws is then employed as well, one jaw being dug into the upper quadrant of the margo circumtonsillaris above the extruded upper pole, and the other jaw is placed against the lower pole. Approximation of the blades forces the tonsil to assume a still more pedunculated aspect.

The wire loop is then passed down over the spoon-ended jaws to the margo, and strangulation slowly carried out; the wire is tightened till the tonsil is hanging by a small pedicle containing the unsevered vessels, evidenced by no bleeding up to this point. The vulsella is then detached and the snare left *in situ*, whilst the other tonsil is similarly dealt with by means of a second snare. The surgical peduncle of the first tonsil dealt with is then severed by further slowly tightening up the wire loop. In some instances, scarcely 10 minims of blood is to be seen in the tonsillar bed, but if, in spite of taking time over the snaring, there is a dram or two of blood present, a swab of cotton wool or gauze is inserted in the tonsil bed and then the enucleation of the other tonsil proceeded with. If there is a little hæmorrhage, it can usually be dealt with at once by pressure, and the two beds left quite dry. The snare operation to be hæmostatic must be a deliberate and slow one. Should, as rarely happens, this method fail as a satisfactory hæmostatic procedure, more especially when there is a spurting artery or a profusely bleeding venous plexus at the lower part of the bed, then the hæmorrhage must be dealt with by further pressure and if necessary by ligature.

ENUCLEATION WITH THE HÆMOSTATIC GUILLOTINE.

From the year 1827, when Physic invented his guillotine, to the end of the nineteenth century the guillotine method held the field. The fact, that the removal was often incomplete and unsatisfactory, led Ballenger, in 1899, to resuscitate in an improved form the old operation of enucleation *en masse* by dissection; hereafter removal of the entire tonsil complete in its capsule became the rule aimed at, whether carried out by the snare, by dissection, or by a combination of these two methods, and the old sharp-bladed guillotine method was largely superseded. Indeed, it seemed destined to become almost obsolete after the introduction in 1908 by Waugh of his improved method of enucleation by blunt dissection. In 1911, however, Whillis in this country and Sluder in the United States independently modified the technique of the old guillotine operation, and showed that a perfect enucleation could usually be accomplished cleanly by the use of a guillotine with a reinforced shaft and a blunt-edged blade instead of a sharp one. Their technique was similar in principle but different in detail, as will be shown later, and as the result of their efforts the guillotine method has been restored to its former pre-eminence, at all events in this country and in America, as the operation of choice for enucleating tonsils in the general run of cases in children and adolescents.

It may be pointed out that a blunt-bladed guillotine acts more on the principle of the *écraseur* rather than of a cutting instrument like the old sharp guillotine.

In the original technique of Whillis, which was later perfected and described by him in conjunction with Pybus, the shaft of the instrument, instead of being passed in a sagittal direction through the mouth to the fauces, was made to traverse the buccal cavity in almost a transverse line passing from the retracted angle of the mouth to the fauces of the opposite side, and at the same time the tonsil was insinuated through the fenestra by the aid of digital pressure on the anterior pillar. When the blade, the edge of which was not keen, was forced home, the tonsil was isolated and almost enucleated but held by an artificial pedicle, formed of the subtonsillar areolar tissue and vessels; as it was not possible in most instances to crush through this pedicle a combination of torsion and traction had to be carried out in order to tear through the pedicle and detach the tonsil. The consequence was that the vessels were torn through below the site at which they are crushed, and so the hæmostatic effect of the crushing blade on the vessels in the pedicle was reduced.

In 1912, Ballenger, realizing that a single blade cannot be expected efficiently to fulfil at the same time the functions of crushing and cutting, conceived the idea of employing two blades lying side by side in the bed of the shaft, the deeper one being blunt and first pushed home for the purpose of isolating the tonsil and crushing the vessels in the pedicle, and the second blade being sharp for detaching the tonsil superficial to the clamped portion of the pedicle.

In 1913, La Force, in U S.A., and Elphick and Howarth in this country, severally and independently described two-bladed guillotines on the same principle. La Force indicated the principle of his instrument by naming it the hæmostatic tonsillectome, and advised that the crushing blade should be allowed to remain *in situ*, securing the vessels of the pedicle for five minutes, so as to produce hæmostasis. He, like Elphick, claimed that by this technique, though the operation took longer and had to be carried out under prolonged anæsthesia, the result was well worth the extra time, because the amount of blood lost was always considerably reduced, usually trifling, and in some few cases the operation was practically bloodless.

The technique of this, the hæmostatic guillotine operation, is sufficiently indicated in the descriptions appended to the accompanying diagrams. The positions taken up by the instrument are the same as in the single-bladed guillotine method, but it is well to mention that StClair Thomson figures, in his widely studied text-book, a diagonal rather than a nearly transverse position of the shaft of the guillotine in the buccal cavity, approximating to Sluder's position; but this is possibly due to a misconception on the part of the artist, rather than to any deliberate intention of the author to make any real deviation from Whillis' technique with regard to this particular point.

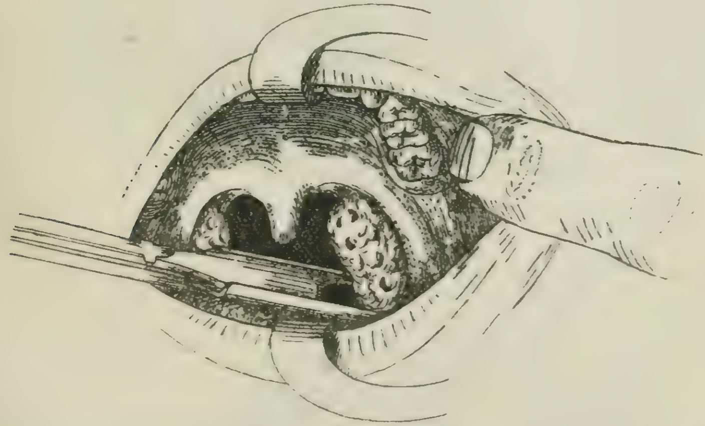


FIG. 4.—*First stage of the Whillis method of enucleating the tonsil with the guillotine. The hæmostatic guillotine is here shown instead of the Lennox-Browne instrument used by Whillis, and is seen in an oblique position across the buccal cavity, midway between the diagonal and transverse positions. The fenestral end of the shaft is shown engaging the lower pole of the tonsil from below. Whillis's original technique is employed now in the United States of America, under the guise of Beck's or the modified Sluder method.* (*Diagram by the author.*

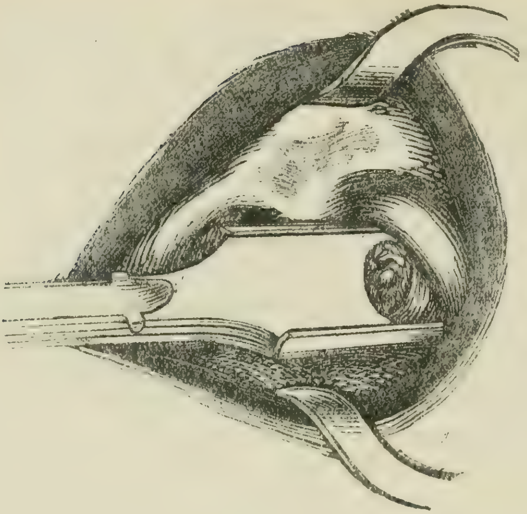
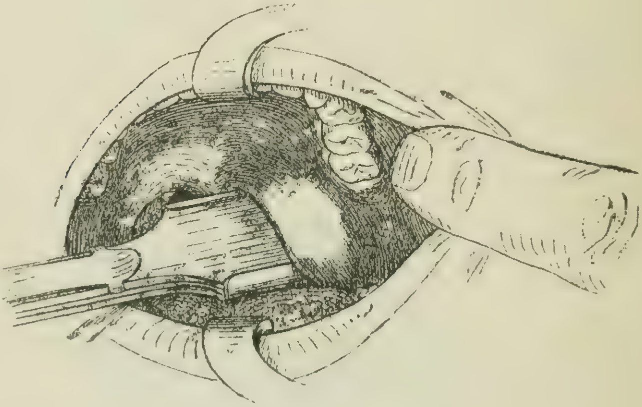


FIG. 5.—*This diagram shows the end of the first stage of Whillis's reverse guillotine method. Note the transverse position of shaft of guillotine in buccal cavity and the tonsil crowded upwards, bulging anterior pillar. Part of the plica is well seen.*

FIG. 6.—*Appearance of anterior pillar (bulging) before tonsil is entirely through fenestra.*



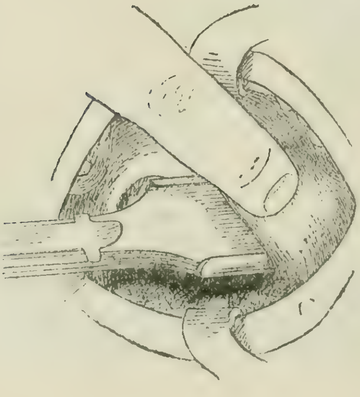


FIG. 7.—*The entire tonsil, with its capsule, manipulated completely through enestra by the finger.*

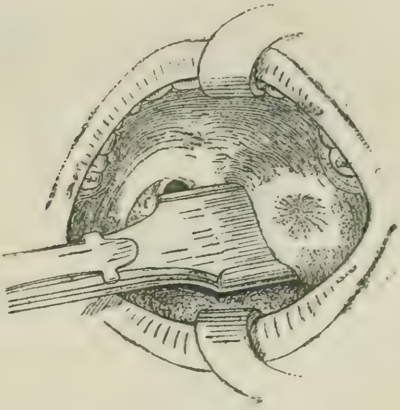


FIG. 8.—*Appearance of anterior pillar after tonsil is pushed entirely through fenestra. Second stage.*

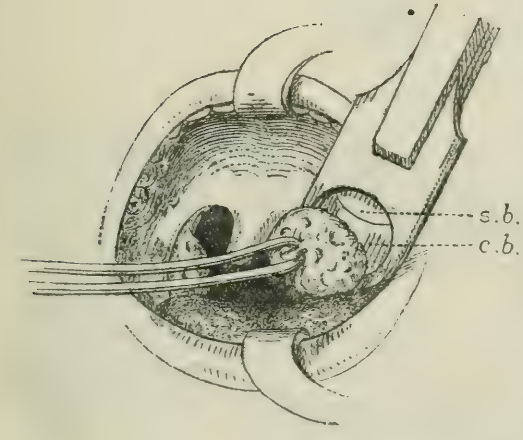


FIG. 9.—*The tonsil has been enucleated by the working home of crushing blade* c.b., *but is held by a pedicle, which latter is then cut through on its uvula side, by driving home the sharp cutting blade* s.b., *smartly and forcibly. Third stage.*

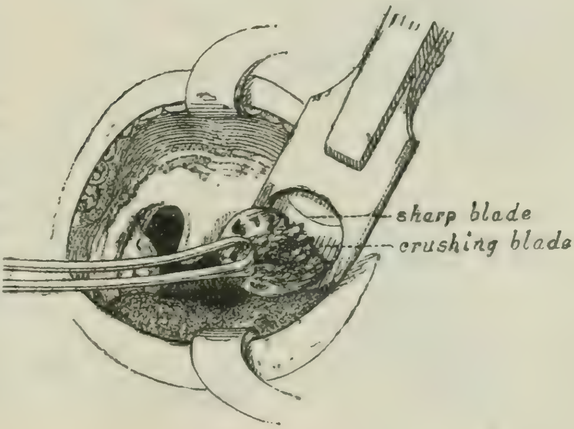


FIG. 10.—*This diagram shows the same stage as the last diagram but the parenchyma is seen to be ruptured as the result of digitally forcing the everted tonsil through the fenestra.*

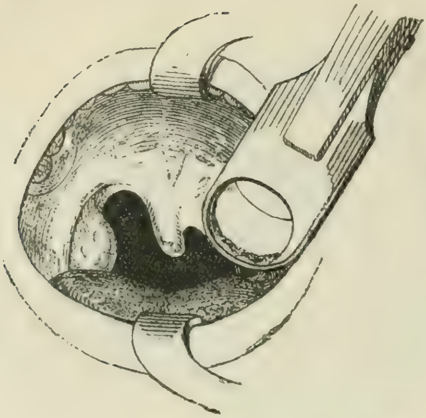


FIG. 11.—*The tonsil has been removed, but the pedicle is still held, for hæmostatic purposes, by the crushing blade. Fourth stage.*

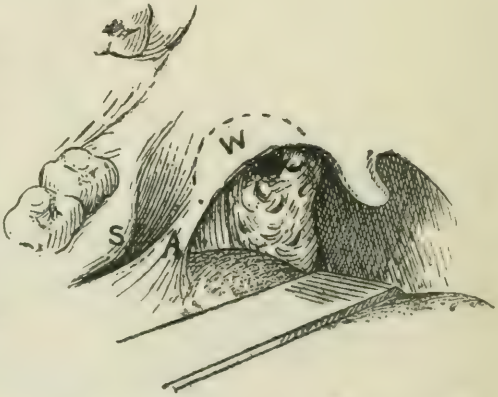
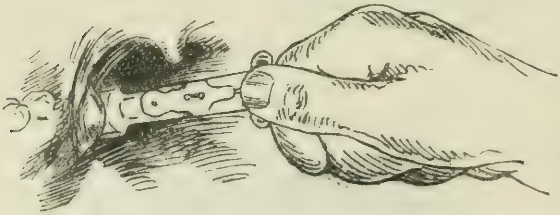
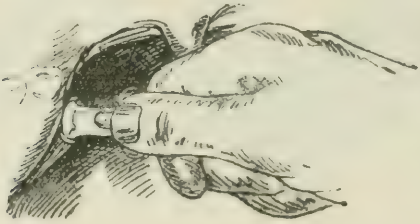


FIG. 12.—*Side view of right fauces.* A *is on anterior pillar with anterior part of the plica just behind.* W *and the interrupted curved line shows the position of the free border of the fenestra of the guillotine in Whillis's method; it also indicates the position of the buried upper pole of the tonsil.* S *is on the dental eminence of Sluder.*





FIGS. 13 *and* 14 *are diagrams reproduced from an article by Sluder* (Journ. Amer. Med. Assoc., *March*, 1913) *founded on similar tone drawings by Ballenger and designed to explain Sluder's technique of dislocating the whole tonsil forwards by the guillotine towards the mandibular eminence formed by the roots of the last lower molar tooth which is used as a "point d'appui" to facilitate enucleation.*

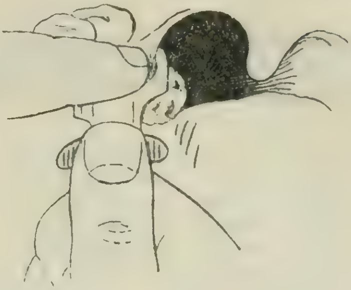


FIG. 15.—*Shows the final stage of enucleating the tonsil by Sluder's technique (after Ballenger and Sluder).*

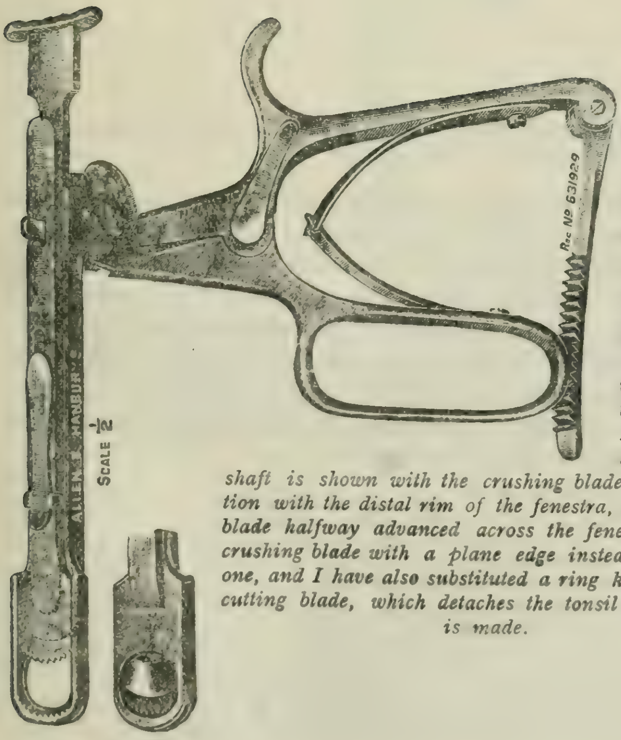


FIG. 16.—*The Elphick hæmostatic guillotine. The crushing blade, with the serrated edge, on the upper surface of the shaft, is seen slightly advanced across the fenestra. Below, the under surface of the shaft is shown with the crushing blade in approximation with the distal rim of the fenestra, and the cutting blade halfway advanced across the fenestra. I use a crushing blade with a plane edge instead of a serrated one, and I have also substituted a ring knife end to the cutting blade, which detaches the tonsil when traction is made.*

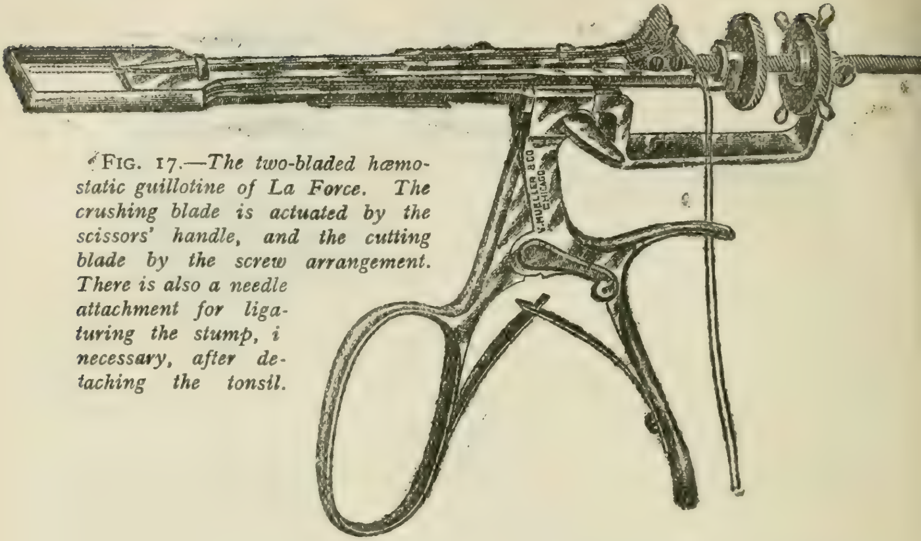


FIG. 17.—*The two-bladed hæmostatic guillotine of La Force. The crushing blade is actuated by the scissors' handle, and the cutting blade by the screw arrangement. There is also a needle attachment for ligaturing the stump, if necessary, after detaching the tonsil.*

HÆMOSTATIC ENUCLEATION WITH THE COMBINED GUILLOTINE AND SNARE.

In the United States, Sluder has added a wire loop adjacent to the fenestra, worked by a ratchet on the shaft of the Ballenger-Sluder guillotine. After the tonsil has been isolated by the crushing blade, the pedicle is then severed by the wire loop deep to the crushed and clamped portion. This point of severance is not ideal, and the method is inferior to that with the hæmostatic guillotine with two blades, in which the tonsil is removed superficially to the crushed portion of the stump which is not severed.

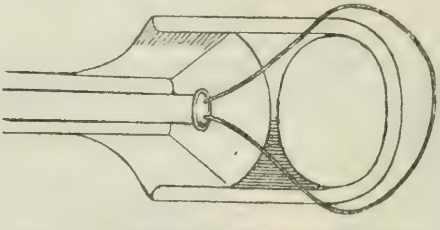


FIG. 18.—*Sluder's Guillotine with snare attachment.*

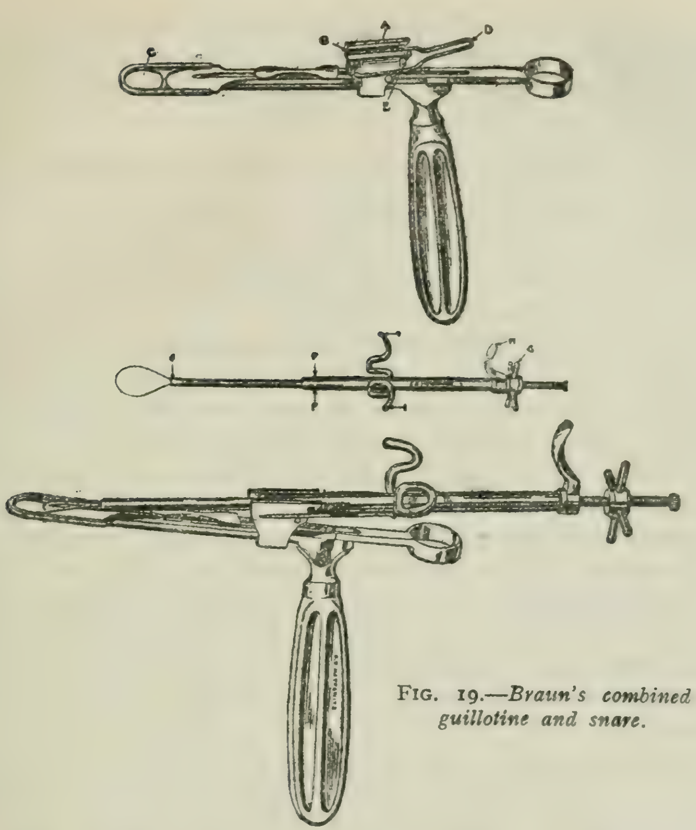


FIG. 19.—*Braun's combined guillotine and snare.*

Braun, of New York, attaches a detachable snare to the guillotine; when the tonsil has been isolated by the blunt blade the guillotine portion can be removed, leaving the snare *in situ*, securing the vessels of the pedicle or stump for as long as may be considered necessary. Two snares are required for one guillotine when both tonsils require to be dealt with, as is usually the case.

This method has the advantage over the snare alone, that it is applicable to those numerous tonsils which are not sufficiently pedunculated to be dealt with by the pure snare method, and it is a much more hæmostatic procedure than the use alone of the one-bladed blunt-edged guillotine, such as the Mackenzie or the Ballenger type of instrument. In fact, this combined guillotine and snare has probably a promising future. The ingenuity displayed by the inventor in devising the instrument hardly extends to his selection of a name for it. He calls it "the snaretome"!

ENUCLEATION BY BLUNT DISSECTION THROUGHOUT.

The dissection of tonsils more or less completely by the employment of the vulsella and scalpel, aided by the finger, was an operation of considerable antiquity even at the time of Celsus, and it was the method of choice of general surgeons even down to quite recent times. In their hands, it was usually an extremely sanguinary and often a very ragged operation; more or less of the tonsil was left behind, and a clean, unwounded, tonsillar bed was the exception. Ballenger's operation, introduced in 1899, and likewise performed with forceps and scalpel, but under a local infiltration of the circumtonsillar area with cocaine and adrenalin, and with the aid of good illumination from a frontal headlight, was a much cleaner dissection, and effected a complete enucleation in most cases; but it was usually a more sanguinary procedure than the recent method of blunt dissection described by Waugh in 1908, but practised by him earlier than that date.

The essential feature in Waugh's technique is the use of a long, narrow-bladed dissecting forceps, with toothed ends to the blades; with this instrument the thin mucosa of the margo circumtonsillaris is first of all nipped up and torn through along the side of the anterior pillar, thus exposing the capsule of the tonsil, and from this starting area the margo is severed completely round, and the capsule subsequently freed from its connections with the tonsillar bed, by using the closed blades of the forceps as a blunt dissector to break down the strands of areolar tissue and vessels passing between the capsule and the tonsillar bed. The procedure as carried out by its most skilful exponents at the present day differs only slightly in detail from Waugh's original method.

I shall here describe the special form of improved technique with which I am most familiar, and which, I believe, is almost identical with the steps of the operation now carried out by the originator of the method.

Position of the Patient.—Several years ago Ballenger pointed out, and figured in his text-book, the advantages of what may be described as the tracheotomic or, more nearly, the direct vision, endoscopic position in tonsil operations; the patient lies on the table with the shoulders (not the neck) raised by a pillow and the head slightly lowered by backward extension of the neck. The operator stands or sits at the head of the table in the position usually occupied by the anæsthetist, and, after Doyen's or the Collin-O'Dwyer gag has been inserted, he is thus able to get an uncramped direct view of the operative field, which is rendered more open if the tongue is held forward with a ligature, or a special tractor forceps, by a trained assistant standing on the right of the patient, who, at the same time, flattens the tongue with a depressor in cases in which it shows a tendency to arch up and interfere with the line of vision; this latter should extend to a good view of the lower pole of the tonsil. A good assistant, when available, can manage to keep the tongue in the correct position with one hand, leaving the other free for pressure-sponging the area of operation. When an assistant is not available, the anæsthetist manages the tongue and the surgeon must do his own sponging. The anæsthetist should take up a position on the left side of the table for the further administration of anæsthesia (*e.g.*, chloroform through Junker's apparatus), should it be necessary during the course of the operation.

The question of the *choice of anæsthetic* has already been discussed in a separate section. Of all methods of tonsil enucleation this has the disadvantage of requiring the most prolonged and deepest anæsthesia. A preliminary injection of atropine followed by open ether is the safest procedure.

The patient being well under, the first step is to seize the tonsil with a vulsella so as to subluxate it in its bed and drag it somewhat forwards and towards the mid-line of the fauces in order to bring into view more of its surface, and especially to expose fully the annular plica, more particularly in its upper half, which is often hidden in its natural retracted state. I find Tilley's modification of Sajou's vulsella, which is on the principle of the old-fashioned artery forceps, by far the handiest instrument for the purpose; it has the great advantage over the instruments with a scissors-handle that the wire loop of a snare can easily be passed down over the vulsella by those who prefer, as I do, to sever the lower pole of the tonsil from its bed finally by that instrument.

The exact points of insertion of the jaws of the vulsella are of real importance; one jaw—the posterior—is dug into the crypta magna while the teeth of the other jaw are inserted into the surface of the annular plica not far from its free edge about the anterior region of the plica semilunaris; the jaws are then approximated and held closed by the spring of the vulsella. Traction will bring into view the upper and front aspect of the annular plica and of the adjacent margo circumtonsillaris. The mucosa of the margo is then nipped up with the toothed jaws of the long dissecting forceps, at a point in the region of the junction of the upper and anterior quadrant of the margo; the mucosa is then torn through at the point nipped up, and the onward sweep of the extremities of the closed blades of the dissecting forceps causes a linear rent in the mucosa of this part of the margo, but which *appears* as a triangular rent, due to the fact that traction is at the same time made by the vulsella; in this triangular rent is seen for a few seconds the glistening whitish capsule, soon, however, to be obscured somewhat by hæmorrhage.

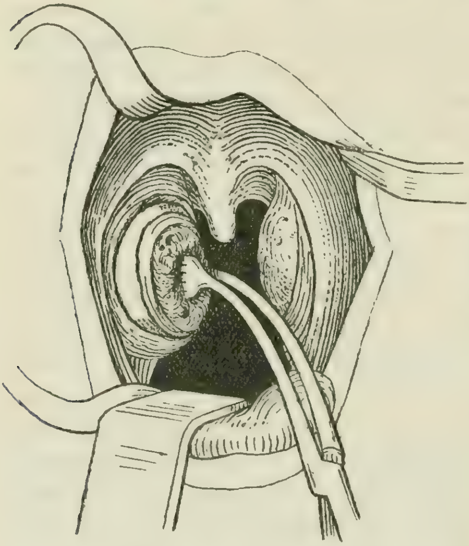


FIG. 20.—*Barnes's diagram showing the mucosa of the plica severed near its free margin instead of at the margo circumtonsillaris, as practised by Waugh, Ballenger and others.*

With this preliminary exposure of the capsule, the closed forceps should be rapidly used as a dissector to tear through the mucosa along the anterior part of the margo, adjacent to the anterior pillar and right down to the lower pole; the margo is then similarly torn through along its upper quadrant between the adjacent margo supratonsillaris of the palate and the plica semilunaris. Traction with the vulsella will cause a portion of the capsule of the buried upper pole of the tonsil to come into view, and the strands connecting it with the upper dome-like portion of the tonsil bed are rapidly severed by blunt dissection. The separation is continued along that portion of the tonsil which is adjacent to the upper halves of the pillars; when the upper pole and front portion of the tonsil have been dissected fairly free, the vulsella is swung round so that its shaft is near the angle of the mouth on the same side, so as to expose the posterior quadrant of the margo circumtonsillaris adjacent to the posterior pillar. It may be necessary to take a fresh grip of the tonsil with the forceps at this stage; or it is sometimes an advantage to use a forceps with a bigger grip, and I use at this point a vulsella on Tilley's principle at the fulcrum, but with large fenestrated jaws like gland forceps.

A satisfactory view of the posterior part of the margo having been obtained, the mucosa is severed along the line of the margo down to the lower pole, and the remaining adhesions of the capsule to the bed are rapidly broken down by blunt dissection, until the tonsil is connected only by a strong fibrous band at the extreme limit of the tonsillar bed. This band is sometimes so tough that very firm lateral pressure with the closed blades of the long dissecting forceps is needed to break it through, and in doing so the grip of the vulsella may break away from the tonsil. To avoid these troubles some operators prefer finally to sever the tonsil from the lower end of the bed with either a snare or with scissors after clamping.

The operation is not complete, if we have omitted to remove as well an accessory faucial tonsil (lingual extension), if such is present below the tonsillar bed and outside the limits of the capsule. In dissecting a tonsil from its bed, it is of great importance to keep the dissector close to the capsule so as to sever the connecting bands just where they join the capsule, for by this means we leave behind the loose areolar layer of pharyngeal fascia, which lines the muscular bed. Dan McKenzie, Goodale and others point out that in the enucleating guillotine operation the blunt blade nicely separates the two layers of the pharyngeal fascia, viz., the specialized firm capsule from the loose areolar layer of the bed, which latter is not removed, whereas in dissecting operations, even when performed by very expert operators, a certain amount of areolar tissue is removed and found adhering to the capsule of the enucleated tonsil. I do not dispute this, but I am by no means convinced that this thin loose layer is much of a protection to the eviscerated muscular bed; in any case, an inflammatory exudation is rapidly thrown out and speedily organizes. Some specialists paint on Whitehead's varnish as an additional protection.

I have here described the various steps of the operation without any reference to any checks from embarrassing hæmorrhage. I do not, however, wish it to be understood that the operation ever goes off in a manner approaching a dissection on the cadaver, which the foregoing description might appear to suggest. I have indicated the steps of the operation in a methodical manner merely for lucidity of exposition, and in the interest of those seeking information.

As a matter of fact, the operation, however satisfactory as a *certain method of complete enucleation*, is by no means hæmostatic *during its progress*, for we are apt to be baulked and delayed by embarrassing bleeding at any, and sometimes at every, stage of its performance. This has to be checked from time to time to allow us to proceed with precision, and see as far as possible every stroke of the dissector; to this end, pressure with a cotton-wool swab or a firmer swab wrung out with boric acid has to be applied from time to time, either by a trained assistant or by the operator. If a spurting, or even a very profusely bleeding, vessel is encountered, we may be compelled to stop dissecting in order to ligature it, though some surgeons are content to apply pressure forceps, and proceed with the operation; but an additional instrument occupying the field of operation is sometimes a great disadvantage, particularly with small children.

When the first tonsil has been removed, if there is still much hæmorrhage, firm pressure may be made on the bed either with a swab on forceps or on a holder, or by firm pressure with the finger. Should much bleeding continue, the area should be seized with forceps and a ligature applied either at once or after the other tonsil has been dealt with. If there is only slight oozing after applying pressure, a dry wool swab is placed in the bed, and the other tonsil forthwith dealt with. When both have been dissected out, pressure is again applied until both beds appear to be nearly, if not quite dry. *A dry bed is the ideal to be aimed at as the best prophylactic against secondary hæmorrhage.*

Although I give personal preference to the routine use of Waugh's long forceps as a dissector, some operators employ other forms which fulfil the purpose quite well. Dan McKenzie's dissector has one edge plane and the other serrated, which enables the stretched bands between the muscular bed and the capsule to be easily torn through by jerking strokes. Stuart Low's dissector has a dissecting point and edge at one end, whilst the other is formed into a blunt curved elevator. I have resorted to each of these instruments on occasion with satisfaction in very adherent tonsils. I always like to have them at hand. In cases which have been the subject of quinsy, or on which two or more incomplete operations have been performed, it may be necessary to employ either a scalpel or a pair of blunt-pointed tonsil scissors, curved on the flat, to get through tough inflammatory tissue and reach the capsule. In such an exceptional case in a girl of fourteen, Waugh's dissector failed to penetrate a keloid condition of the mucosa at the margo, and I found a cutting instrument in this case really necessary.

Some surgeons habitually use scissors for incising the margo upon beginning a dissection enucleation, in preference to a blunt dissector.

ENUCLEATION BY PRELIMINARY SUBTOTAL DISSECTION, COMBINED WITH THE USE OF THE SNARE FOR DETACHMENT OF THE LOWER POLE.

This is the method which I usually employ myself when I decide to resort to dissection. The steps of the operation are identical with those described above as the improved Waugh technique, up to the time that about three-fourths of the tonsil has been dissected free of its connections; the wire loop of a snare, Eve's or Beck's special tonsil snare, is then passed down round Tilley's or other form of vulsella, and the enucleation completed by detaching the lower pole by strangulation. The advantages of this technique which appeal to me are (1) the quicker and cleaner severance of the remaining lower attachments of the tonsil, at a time when the view is liable to be obscured both by hæmorrhage and by reason of its being the deepest and most hidden part of the operative field; (2) the hæmostatic effect of the wire loop in strangulating the venous plexus in the lower part of the tonsillar bed; and (3) the ease with which the accessory faucial tonsil (lingual extension), outside but adjoining the lower limit of the capsular plica, can be included in the loop and removed complete together with the faucial tonsil proper. In the dissection operation this accessory lymphoid mass, when well developed, has to be clamped and dissected out, or cut off separately; whilst in the guillotine operations it is more often than not similarly left behind, and requires separate removal when prominent.

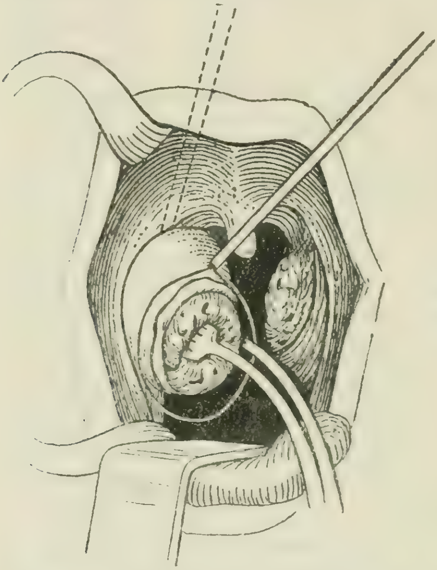


FIG. 21.—*Diagram after Barnes (U.S.A.) to show the tonsil partially detached by dissection through the margo and in the upper two-thirds of the tonsil bed with the initial and final positions of the barrel o the snare.*

TREATMENT OF SECONDARY HÆMORRHAGE.

The method of dealing with a bleeding tonsillar bed or beds, after the patient has left the table and come out of the anæsthetic, does not differ in principle from the treatment of primary hæmorrhage already discussed, but it includes in addition to pressure and the ligature of vessels, the occasional use of the hæmostatic tonsil forceps, and on very exceptional occasions it may involve resorting to the device of temporarily bringing the pillars of the fauces together with sutures.

The *hæmostatic forceps, e.g.*, Watson Williams's pattern, are useful for immediate application, but never for long to the tonsil bed or beds directly we are called to a case of bad secondary hæmorrhage; one jaw of the forceps should rest on a swab inserted in the bed, and the other lies *vis à vis* outside on the cheek near the angle of the mandible. This serves to check bleeding whilst things are being prepared for the possible administration of an anæsthetic, which may be urgently indicated when ligaturing is required in frightened or unruly children. Unfortunately, the hæmostatic forceps are sometimes not tolerated by children even for five minutes.

For temporarily bringing together the pillars, an anæsthetic is nearly always necessary whatever the age of the patient; and the more experienced and resourceful the anæsthetist, who usually has to co-operate as assistant as well, the lighter the task of the operator. Good illumination with an electric head light is most essential, and so is Doyen's gag.

Different operators vary considerably in their readiness to resort to ligature of bleeding vessels during and remotely following enucleation; some rely mainly on patient persistent pressure, whilst others think time is saved by proceeding to ligature without much delay, if pressure for two or three minutes does not prove satisfactory. Tilley, for instance, who can claim great experience in enucleation by dissection, now resorts to ligature with increased frequency, in order to reduce the amount of blood immediately lost, and also as a safeguard against the early occurrence of reactionary hæmorrhage.

In my own practice, I rely largely on pressure efficiently applied for primary bleeding, and reserve ligature for the most part for the very small number of secondary hæmorrhages with which I have to deal. The drier the tonsillar bed is left at the close of operation, the less the likelihood of reactionary, *i.e.*, early secondary, hæmorrhage. It must be admitted that in some cases the induction of a dry tonsil bed takes considerable time, so that it is more conveniently carried out on private patients than on others, and it is only feasible under prolonged and fairly deep general anæsthesia.

In older children, with some self-control, and in adults, an attempt should be made to *staunch the secondary hæmorrhage by pressure* without anæsthesia. The advice is usually given to remove the clot from the tonsil bed before applying pressure, but however necessary this may be, when we are compelled to tie a vessel, I do not see so much object in bothering about removing the clot previous to the preliminary application of swab-pressure with a holder or with forceps or with the finger. If the bleeding does not cease in from 10 to 15 minutes, I think one is justified in putting children under an anæsthetic and proceeding to turn out the clot and find the bleeding vessel or vessels, and seizing it or them with pressure forceps, and carrying a loop of catgut down with dissecting forceps and ligaturing.

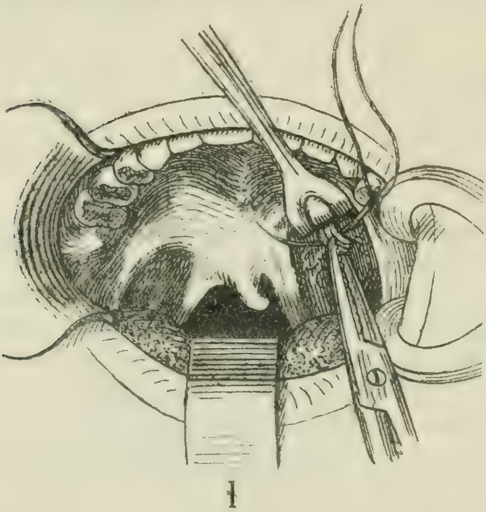


FIG. 22.—*Method of Leslie Davis (U.S.A.) of ligaturing bleeding areas. The needle passes through the substance of the muscular bed.*

Anyone who pictures to himself a not over-confident and inexperienced practitioner, with two, possibly large, fingers in a young child's small buccal cavity, which is already encumbered with the presence of forceps, endeavouring to pass the loop of a catgut or silk ligature down to the bleeding area seized by the forceps, will realize that the airy advice to resort to this procedure of "ligaturing without unnecessary delay" shows small appreciation of the difficulties surrounding its accomplishment. Hence the advisability of being provided with a good method of illumination, and requisitioning the assistance of a first-rate anæsthetist and, if possible, a resourceful assistant.

But how often are any, much less all, of these desiderata available in a hurry, and often at a belated hour, in country or even in suburban practice? The best place is in a hospital or nursing-home, but many cases do not admit of the necessary delay, and in others such accommodation is not at hand. One can, therefore, readily understand anyone deciding to *bring together the pillars of the fauces by means of Michel's hooks*—a comparatively easy procedure—so as to tide over temporarily the immediate danger from loss of blood, and ensure a night's rest free from anxiety both for the patient and the practitioner.

In favourable circumstances, however, it is obviously not only sounder surgery to secure each bleeding point, but it will be found next day that the patient's fauces are in a far different condition to that after ligaturing the pillars, when there is often much pain, increased on attempted swallowing, and the pillars and adjacent uvula are turgid and œdematous; moreover, although it is easy enough to apply two or three hooks with the special instrument supplied for the purpose, it is by no means easy to take them out again, even with the aid of the special extractor, without tearing the pillars. A lateral pharyngeal abscess, deep to the superior constrictor, has been known to follow their insertion, and a nasty septic sequela is not uncommon.

Some of these objections apply equally to *sewing up the pillars with a silk or catgut ligature by* means of the technique devised by Irwin Moore, or by other methods. Here the real difficulty is not in removing the ligature next day, but in inserting it, though Moore's ingenious technique has simplified the method by employing a curved needle on a shank, flattened proximally, for passing through the pillars; the apparatus is on the lines somewhat of a cleft palate needle. He also has devised a special forceps to facilitate tying the ligatures. This method has the advantage of allowing a small pad of wool or lint to be placed in the bleeding tonsil bed before tightening up and tying the ligatures, but it appears to be quite effectual without this, in Moore's experience. Suturing should be a *dernier ressort*, in my opinion.

Local Styptic Applications.—I have hitherto said nothing about swabbing the bleeding tonsillar bed with hæmostatic fluids, applied by means of cotton wool on a holder, because I have found them generally disappointing. They are necessarily immediately diluted in profuse hæmorrhages, and are extremely messy. Liquor ferri perchloridi, which was much recommended in my student days, is not merely messy, but, as some of it passes downwards, it is liable to irritate the epiglottis and vestibule of the larynx and induce spasm; it also leads to a dirty slough which may become septic, and recurrent hæmorrhage after it is not unknown. The same objections apply in a lesser degree to styptic colloid and to turpentine. I used to employ the former on occasion, but have never tried the latter, though Lake informs us that he never goes to deal with a tonsil case without taking a bottle of turpentine with him. A solution of peroxide of hydrogen is employed as a routine application by Sargnon, immediately after enucleation by means of his snare method. The pharynx fills up with a sanguineous frothy mass, which may enter the air-passage and cause pronounced and sometimes dangerous respiratory embarrassment. Hamamelis, hazeline, and adrenalin solutions are all soon diluted and their action usually disappointing.

The thick paste, made by mixing equal parts of tannic and gallic acid with water, was at one time used as a routine application in tonsillar bleeding at the Golden Square and at the Central Throat and Ear Hospitals Its use is disappointing in the really serious cases.

As I have already mentioned, syringing the fauces with ice-cold water is of some use in checking primary bleeding after enucleation under short anæsthesia, but it is not of much use in serious cases of secondary hæmorrhage.

Hypodermic Injections.—It is generally admitted that morphia injections are well worth trying, except when contra-indicated by reason of the age of the patient. In the latter circumstance, injections of ergotin (viz., 5 to 10 minims of a 12 grain to the drachm solution) can be tried every three hours. In those rare cases of recurrent oozing, they are said to be really useful. I have occasionally given ergotin injections in secondary hæmorrhage, but bearing in mind the necessary fallacies in therapeutic deductions, especially when applied to a small number of observations when other measures are simultaneously adopted, I am by no means sure that ergotin is quite so valuable in tonsillar hæmorrhage as some claim. Pituitrin has also been lauded.

SUMMARY.

1. Serious hæmorrhage is rare in connection with tonsil operations, but when it does occur, it may be a very grave complication.
2. Careful selection is advisable before removing tonsils, even in apparently healthy children, and even though the number of cases which had better be excluded, or else dealt with in a special manner, is admittedly both relatively and actually small—probably not 1 in 1,000.
3. Prophylactic treatment is useful in "bleeders" and in anæmic subjects.
4. Hæmostatic methods of enucleation demand both experience and skill on the part of the operator and anæsthetist, and a fairly prolonged and deep anæsthesia is usually necessary. Open ether, preceded by a hypodermic injection of atropine, is the safest combination for deep anæsthesia.
5. Hæmostatic methods that insure dry tonsillar beds at the termination of the operation, provide the most reliable prophylaxis as regards hæmorrhage, whether early or remote.
6. Skilfully applied pressure can be relied upon to arrest most forms of tonsillar hæmorrhage, whether primary or secondary.
7. Failing relief by pressure, single or multiple ligaturing of bleeding points is nearly always effectual.
8. Suturing the pillars, either by means of Michel's hooks or by Irwin Moore's highly ingenious and practicable technique, is a sure temporary measure in those rare intractable cases in which separate ligaturing, skilfully carried out, fails.
9. Styptic topical applications and hypodermic medication are usually unreliable expedients.

◆

HÆMORRHAGE FOLLOWING REMOVAL OF THE TONSILS, AND ITS TREATMENT.

By IRWIN MOORE, M.B., C.M.

Surgeon to the Throat Hospital, Golden Square, London, W., etc.

There is reason to believe that hæmorrhage after removal of the tonsils has, during recent years, become more frequent, since complete removal by enucleation has been recognized as a more thorough method of dealing with most cases in which the tonsils are diseased. Though exceptional, it is unfortunately met with sufficiently often to merit serious attention.

That the importance of this subject is acknowledged is shown by many references both in past and current literature. One writer says: " though the removal of tonsils, thoroughly performed, is usually unattended by untoward result, still it is not entirely free from alarming, sometimes dangerous, results; and, though these appear to be the exception, they should not be ignored; and the surgeon must always be prepared both mentally and manually to cope with a hæmorrhage that may unexpectedly occur." Another refers to hæmorrhage as " the dreaded of all sequelæ after tonsil removal," and says " the number of these cases is alarmingly on the increase."

Although the deaths reported from hæmorrhage are few as compared with the enormous number of tonsils operated upon—and it is roughly computed that there are not less than 500 of these operations performed per week in London hospitals alone—yet there are undoubtedly a large number of cases in which serious bleeding takes place, in many cases exsanguinating and reducing the patients to such a degree of prostration, even to the point of actual danger to life, that it may be many months before they recover. Cases of persistent anæmia lasting for years have been reported.

From time immemorial this complication has been looked upon as an uncertain factor, and with considerable anxiety, so that few surgeons undertake the operation, especially in adult life, without being prepared for such an emergency. Every case of severe or prolonged hæmorrhage following the removal of tonsils is of sufficient importance to be recorded, yet few of these cases are reported, the majority only being heard of incidentally. It has been suggested that this is in all probability due more to the undesirability of heralding such facts than to their non-occurrence. Though hæmorrhage may at times be exceedingly troublesome, and in some cases alarming, there is no reason why it should cause anxiety, or reach the stage that is exhausting to the patient, or dangerous to life, if we keep in mind that it can easily be controlled by proper surgical measures. Hæmorrhage in the tonsillar bed* should be treated like hæmorrhage in any other part of the body. It does not matter whether the bleeding is arterial from a spurting vessel, venous bleeding, or capillary oozing from a large surface, if spontaneous stoppage does not occur, then, as in hæmorrhage elsewhere, the really efficient, and certain method of checking it is compression or ligature.

HISTORICAL.

The operation of excision of the tonsils is of great antiquity, for it appears to have been frequently performed even before the days of Celsus, A.D. 10. He was the first to describe the operation of complete removal, by the method of loosening the tonsil from its bed with the finger and tearing it out, whilst the question of hæmorrhage was apparently unknown, or at least was not considered important enough to be referred to. From this date up to 1757 there followed a period during which the tonsils were partly removed by hook and bistoury, but the fear of serious hæmorrhage was so prevalent that the operation became practically obsolete, at least was only occasionally attempted in a timid manner by first ligaturing the tonsil and afterwards cutting it away in pieces. From 1757 to 1827 the traditionary dread of hæmorrhage appears to have been forgotten or ignored, for the partial removal by scissors or bistoury again became one of the recognized operations of surgery; but during this period it was only customary to cut off the superfluous portion of the tonsil level with the pillars of the fauces.

The introduction of the guillotine by Physick in 1827, by reducing the risk of hæmorrhage, gave fresh impetus to operative procedure, and the removal of the tonsils with this instrument became the favourite method. Improvements in both instruments and technique have resulted in the guillotine maintaining its well-earned popularity to the present day.

---

* The term "tonsillar bed" is used instead of tonsillar fossa, in order to avoid confusion with the "crypta magna" (Hardie Neill) and misnamed the "supra-tonsillar fossa." (D. Paterson.)

It is interesting to note that in 1860 Borelli, an Italian, revived the method of enucleation with the finger with great success, and he confirmed the description of Celsus that the operation was easy of execution and devoid of risks of hæmorrhage.

STATISTICAL RESULTS OF PARTIAL COMPARED WITH COMPLETE REMOVAL OF THE TONSILS IN RELATION TO HÆMORRHAGE.

William Hill,[1] an authority on nomenclature, has pointed out that the term "tonsillotomy"* is not even suggestive of partial excision, and has advised that it should only be used where it can rightly be placed, viz., in cases in which an incision is made into the tonsil, or opening up a chronically septic crypt. It is obvious, he says, that the term "tonsillectomy" implies equally either a partial or total extirpation of the tonsil by a cutting operation.

In this article, I have used the term partial tonsillectomy to include all cases of incomplete tonsil removal, whilst the term complete tonsillectomy refers only to those cases in which the tonsil and its capsule have been completely enucleated.

In the days before enucleation some statistics were published, and a number of cases of hæmorrhage following the removal of the tonsils were recorded, but they were not complete.

For example, Harmon Smith,[2] in 1904, referred to Jonathan Wright as having collected 31 cases of alarming hæmorrhage in 22 years from 1868 to 1890, an average of about 1 in 3,000 cases, and the former also gave the result of his own investigations during 14 years from 1890 to 1904, viz., 23 additional, including three in his own practice—a total of 54 cases. Of this number, 6 resulted fatally.

Morell Mackenzie,[3] in 1880, referring to the use of the guillotine and to cases of partial tonsillectomy reported by other surgeons, stated that the experience of nearly all writers pointed to the rarity of serious hæmorrhages, and that he himself had only once met with a case in which the bleeding actually endangered life. Lennox Browne,[4] ten years later (1890) in discussing the question of partial tonsillectomy and hæmorrhage, said that it had been most rare in his experience. During 30 years in his own practice and that of his colleagues, amongst fully 50,000 cases he had only seen and known of three or four cases in which the bleeding had been serious, and only one in which it was at all alarming.

---

* In the various reports of cases where the term "tonsillotomy" has been used, the writer concludes that only partial tonsillectomy is referred to.

He pointed out that in those cases on record, in which hæmorrhage after partial tonsillectomy had been fatal, the bistoury had been used in place of the much safer guillotine.

Goodale,[5] in 1913, stated that he had had ten cases in the six years 1907 to 1913 in tonsillectomies. Milne Dickie,[6] in 1914, reported that out of 7,133 tonsillectomies performed at the Royal Infirmary, Edinburgh, during seven years, from 1907 to 1914, there were nine cases of severe hæmorrhages. From 1908 to 1911 enucleation was largely carried out with scissors and snare; since 1911 with the guillotine.

The relative frequency of hæmorrhage in partial or incomplete removal, and in complete enucleation with the guillotine or by dissection, is still a point of discussion amongst surgeons, as well as the question whether bleeding is more common after using blunt or sharp instruments. That considerable divergence of opinion existed in the more recent past may be gathered from the following views :—

Hunter-Mackenzie,[7] in 1893, from an analysis of 230 cases of partial tonsillectomy, stated that profuse or troublesome hæmorrhage never followed the operation. McBride,[8] in 1900, remarked that dangerous bleeding rarely followed partial removal, and that he had only met with one exception; whilst Shurley[9] referred to Delavan as having found only 12 cases of hæmorrhage in the literature covering a period of six years. Damianos[10] stated that out of 159 reported cases of serious bleeding, seven were fatal and two of these were under 13 years of age. Richards,[11] in 1909, collected the opinions of 77 operators on the question of hæmorrhage, and found that there was great variation of opinion, from no hæmorrhage at all to 10 per cent. Chiari,[12] in the same year, reported 27 cases of hæmorrhage out of 600 partial tonsillectomies.

Since the introduction of enucleation, *i.e.*, during the last 20 years, the records are also incomplete, only a small proportion of hæmorrhage actually occurring being reported, so that it is impossible to bring forward satisfactory and up-to-date statistics.

Burack,[13] in 1911, reported 8 cases of hæmorrhage in 2,000 complete tonsillectomy operations, 3 of which were dangerous.

Cocks,[14] in 1912, referred to having found a total of 107 cases of post-operative hæmorrhage after complete tonsillectomy, with 13 deaths, whilst Dutrow[15] reported 206 complete tonsillectomies with 5 severe hæmorrhages. Barnes[16] and Tilley[17] differ from this opinion, and consider that hæmorrhage is less frequent after a well executed complete tonsillectomy than after partial tonsillectomy. Pybus,[18] Whillis,[19] Faulder,[20] E. D. Davis,[21] and others advocate complete tonsillectomy with the blunt guillotine; the first three consider there is no more hæmorrhage than in partial tonsillectomy, whilst the latter believes that there is less. Pybus states that there is less bleeding after complete enucleation with the guillotine than after removal by dissection, and Whillis points out that it is easier to control any hæmorrhage. Luc[22] considers that complete tonsillectomy is more apt to give rise to hæmorrhage than partial tonsillectomy, and this is confirmed by Whale[23] from an investigation of the records of 3,697 tonsil operations, which afforded strong evidence that dangerous hæmorrhage was more than twice as possible. Hill and Elphick[24] have described a method of hæmostatic enucleation of the tonsils by means of a guillotine with a shaft containing two blades, one for crushing and the other for cutting. In this way, primary hæmorrhage may be reduced to a minimum, and delayed or secondary hæmorrhage avoided.

That enucleation with the guillotine can be performed more completely and satisfactorily with blunt-bladed instruments, and that hæmorrhage is more likely to occur after enucleation by dissection than after enucleation with the guillotine, appears to be the experience of most operators. In the latter case, a blunt guillotine causes compression and torsion of the vessels and tissues, hence the danger of hæmorrhage is lessened.

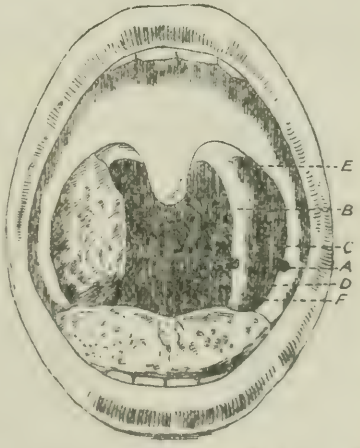
THE SOURCE OF THE HÆMORRHAGE.

All the important vessels in this region, *e.g.*, facial, lingual, internal maxillary, send branches to the tonsils.

Bleeding may, consequently, occur from the following branches, especially when of abnormal size or distribution :—

1. The tonsillar artery, or its branches.
2. The ascending pharyngeal.
3. A branch from the descending palatine (of the ascending pharyngeal).
4. A branch of the ascending palatine artery.
5. A branch of the dorsalis linguæ artery, which is found in the lower part of the tonsil and anterior faucial pillar and supplies them both.
6. Capillary oozing from small vessels in the muscular fibres in the anterior and posterior pillars, or superior constrictor of the pharynx.
7. An enlarged venous plexus at the lower and outer border of the tonsil bed—really dilated veins from stasis.
8. Internal carotid.

The tonsillar artery from the facial after piercing the superior constrictor muscle divides into numerous small branches at the base of the tonsil and enters the capsule (Figs. 2 and 3*d*). Its bleeding point is found in the middle third of the tonsillar bed. (Fig. 1C.)



A. *The anterior faucial pillar containing the ascending palatine branch of the facial artery.* B. *The posterior faucial pillar containing a branch from the descending palatine of the ascending pharyngeal artery.* C. *The tonsillar branch of the facial artery—one of the most common sites of hæmorrhage,* i.e., *the central portion of the tonsillar bed where this artery enters the tonsil.* D. *The tonsillar plexus of veins at the inferior portion of the bed.* E. *The tonsillar branch of the descending palatine branch of the ascending pharyngeal artery.* F. *Tonsillar branches of dorsalis linguæ.* G. *Tonsillar branch direct off the ascending pahryngeal, or from its descending palatine branch. The plica is not shown in the drawing.*

FIG. 1.—*Shows position of the favourite bleeding points after tonsillectomy.*

Ballenger[25] points out that " the smaller the branches cut during the operation the less serious the hæmorrhage. Therefore, if the arterial branches are severed as they enter the capsule of the tonsil, the liability to hæmorrhage is reduced to the minimum; whereas if they are severed on the deep aspect of the superior constrictor muscle before they are broken up into smaller branches, the danger from both primary and secondary hæmorrhage is greatly increased." It is important, therefore, that the technique should be such as not to injure the muscles bounding the tonsillar bed.

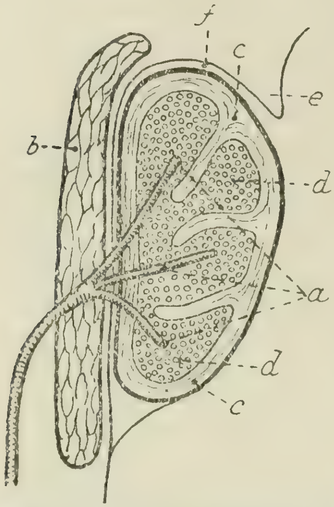


FIG. 2.—*Diagrammatic illustration of one of the commonest sites of tonsil hæmorrhage,* i.e., *the middle of the fossa where the tonsillar branch of the facial artery pierces the superior constrictor muscle of the pharynx (after Ballenger).*

a. *Subdivisions of the tonsillar artery.* b. *Superior constrictor muscle of the pharynx.* c. *Fibrous capsule of the tonsil.* d. *Lymph follicles or substance of the tonsil.* e. *Plica supratonsillaris.* f. *Supra tonsillar rossa.*

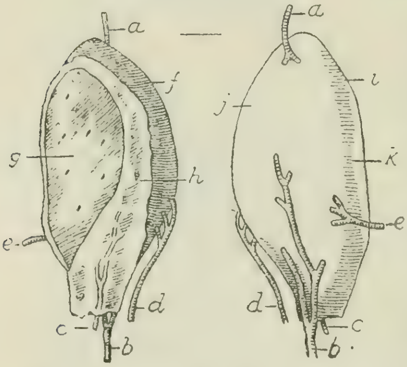


FIG. 3.—*The left tonsil showing its arterial supply (after Fetterolf*[26]*).*

a. *Superior tonsillar branch from the descending palatine branch of the ascending pharyngeal artery.* b. *Inferior tonsillar branch from the dorsalis linguæ; runs up middle of outer surface between capsule and outer wall.* c. *Antero-inferior tonsillar, or artery of the plica triangularis, branch of the dorsalis linguæ.* d. *Postero-inferior tonsillar* — the tonsillar artery— *branch of the facial.* e. *Posterior tonsillar, a branch from the descending palatine of the ascending pharyngeal, and is severed during the separation of the tonsil from the posterior pillar.* f. *Capsule.* g. *Mesial surface.* h. *Annular plica* i. *Posterior surface.* j. *Lateral surface.* k. *Groove for pharyngo-palatine muscle.*

All three of the inferior arteries, namely, *b*, *c*, *d*, are divided at the end of the operation when the surgical pedicle is cut or separated. These three are the largest vessels of the tonsil, and enter towards its lower part.

The ascending pharyngeal artery, from the internal maxillary, is sometimes such a large vessel that its pulsations can be seen distinctly when inspecting the pharynx. It ascends in the postero-lateral wall of the pharynx, well behind the posterior faucial pillar, and sends a branch, the descending palatine, to the soft palate. Conolly[27] showed at the Laryngological Section of the Royal Society of Medicine on November 7, 1913, a boy, aged five years, with enlarged tonsils and adenoids, who had a large pulsating vessel, believed to be the ascending pharyngeal, in the right portion of the posterior pharyngeal wall, partly concealed behind the right tonsil. Stuart-Low[28] reported the case of a boy, aged seven, who had a pulsating elongated swelling on the lateral wall of the pharynx—which was probably an enlarged branch of the ascending pharyngeal artery. The transactions of the old Laryngological Society of London also supply the records of several such cases of pulsating vessels on the posterior wall of the pharynx.

The descending palatine branch gives off a branch to the tonsil, and supplies also the posterior faucial pillar. Its bleeding point is frequently found in the dome-shaped upper part of the tonsillar bed, and is often concealed under the angle formed by the junction of the faucial pillars (Fig. 1E). It is best found by drawing up the supra-tonsillar margin of the palate.

The ascending palatine artery, a branch of the facial, also pierces the superior constrictor muscle, and is distributed along the anterior face of the tonsil (Fig. 1A), the anterior faucial pillar, and the soft palate. The tonsillar branch arising from it, just as in the case of the tonsillar artery (of the facial), pierces the aponeurosis of the superior constrictor muscle, and penetrates the tonsil in the deepest part of the tonsillar bed. It sometimes takes the place of the tonsillar artery.

The Internal Carotid.—Though this vessel in its normal position lies well away from the tonsil, yet occasionally its course may be abnormal. Harmer[29] has reported the case of a girl from whom one tonsil was removed by a house surgeon, and there followed a " tremendous rush of blood," obviously from some large artery which had been cut. The bleeding lasted only a few moments, and the patient collapsed. Three hours later the bleeding recurred, and death followed in ten seconds. Post-mortem, the internal carotid arteries were found to have two coils, and these were pushed in towards the middle line under the posterior wall of the pharnyx. In cutting off the tonsil, one of the coils had been completely removed, so that the two cut ends of the artery were half an inch from each other. Velpeau[30] reported four cases, in which the internal carotid was laid open whilst a portion of the tonsil was being cut away with a bistoury. Crockett[31] reported two cases in which death occurred in two minutes following enucleation of the tonsils with a sharp scalpel, probably owing to severing of an abnormal internal carotid artery. H. J. Davis[32] showed at the Laryngological Section of the Royal Society of Medicine on March 6, 1914, a man aged fifty who had a large pulsating vessel on the posterior wall of the pharnyx, confirmed by Harmer[33] as similar to the case above reported showing a complete coil in the internal carotid artery. Milne Dickie[34] has seen a case in which the artery described a complete loop before entering the base of the skull. A. G. T. Fisher[35] says that, in connection with abnormal tortuosities of the internal carotid artery, when it is in the sagittal plane, it is more likely to be met with in operations on the tonsil.

Predisposing Causes of Hæmorrhage.—1. Acute inflammation of the tonsils.

2. Anæmia and leukæmia.

3. Cardiac and renal diseases.

4. The menstrual period or during pregnancy.

5. Age; occurring more in adults than in children. Due to increased fibrosis, and greater blood supply.

6. Sex; more frequent in males than in females.

7. Hæmophilia and purpuric diseases.

8. Fibroid tonsils; due to the arterioles being embedded in fibrous tissue, and so unable to contract.

9. Malignant disease.

10. Abnormalities in size, or irregular distribution of the blood vessels of the tonsils or adjoining parts.

Exciting Causes.—1. Traumatism, due to clumsy manipulation and faulty technique in unskilled hands, causing injury to the muscles bounding the tonsillar bed.

2. Exertion too soon after operation, coughing, vomiting,

eating, the erect position.

3. Local anæsthesia, *e.g.*, cocaine combined with an astringent as adrenalin predisposing to secondary hæmorrhage.

THE PREVENTION AND TREATMENT OF HÆMORRHAGE IN TONSIL OPERATIONS.

The occurrence of serious hæmorrhage may be avoided in many cases by keeping in mind the predisposing and exciting causes, as well as by carefully examining each patient before operation.

It may be advisable to postpone the operation in certain cases in which hæmorrhage is more likely to occur, *e.g.* :—

Acute inflammation of the tonsils when they are engorged with blood, and hæmorrhage, therefore, more likely to occur; hence, in such cases, it is always advisable to defer the operation for three weeks at least until the inflammatory stage is passed.

Pernicious anæmia and acute leukæmia.—A lookout should be kept for such cases, since well-marked signs of these diseases may not be present. A typical case was shown by C. W. M. Hope[36] at the Laryngological Section, Royal Society of Medicine, in 1914. The patient was suffering from lymphatic leukæmia; the tonsils were enlarged, and covered with irregular dark nævoid patches. A case has been reported of a child aged eleven years, suffering from leukæmia of a lymphatic form, where tonsils and adenoids were removed. An hour afterwards the child began to lose a considerable amount of blood, which apparently came from the post-nasal space. A post-nasal tampon was inserted, but during the night a fresh hæmorrhage occurred, followed by death.

Cardiac diseases, e.g., arterio-sclerosis.

Kidney diseases.—A case has been reported of albuminuric tonsillitis, in which spontaneous hæmorrhage occurred from an ulcer in the upper part of the left tonsil, in a patient suffering from grave kidney disease, with death nine days later after various remedies failed to arrest it. A similar case has been reported, in which the hæmorrhage was attributed to chronic nephritis and the onset of menstruation.

The operation should not be performed during the menstrual period or within a week of its onset, for many cases of serious hæmorrhage have occurred at this time. One case in my own experience especially exemplifies this point :—

A young girl, aged 16, had been operated upon by a colleague, and her tonsils enucleated. Very little bleeding occurred at the operation, but four hours later profuse and persistent oozing of bright arterial blood began from both tonsillar fossæ and continued for five hours, accompanied by recurring vomiting of large quantities of blood from the stomach. No spurting vessels could be seen. A hæmostat, placed in position on one side, only made the hæmorrhage more profuse from the other. Since continuous sponge compression failed to stop the bleeding, and the patient was becoming exsanguinated and exhausted, I advised that the faucial pillars should be sutured *on both sides.* I accomplished this without any difficulty under a general anæsthetic, with my special suture needle, and the hæmorrhage immediately ceased. The ligatures were removed in 15 hours, and there was no recurrence of the bleeding. It was later discovered that the patient had begun to menstruate a few days before her time.

One writer remarks that " a severe hæmorrhage at this time in the life of a young woman is a serious thing, because the reactionary shock on the whole nervous system, and especially on the procreative organs, may have a far-reaching effect on her future welfare." That the danger of hæmorrhage is more common in the adult is shown by statistics, *e.g.*, in one group of 71 recorded cases, only four or five were younger than 10 years, whilst in another group of 31 cases, 20 occurred in persons 18 years of age or over. It is fortunate that this is so, for the difficulty of controlling a child, so as to facilitate efforts for arrest of hæmorrhage in the throat, is considerable. With some exceptions the bleeding occurred immediately after, or within a few hours of the operation.

The operation is contra-indicated in those cases in which there is special reason to expect hæmorrhage *e.g.*, in hæmophilia, purpuric diseases, etc. Special care should therefore be taken to detect the hæmorrhagic diathesis. Inquiries should be made as to the family history of " bleeding." If there is any doubt as to the coagulability of the blood, its index should be ascertained before operation.

Since there is a tendency to attribute all types of slow and persistent bleeding to the condition of hæmophilia, it should not be forgotten that hæmophilia is *very rare,* and is confined to the male sex. Osler[37] says, " in the diagnosis of this condition the family tendency is important. A single uncontrollable hæmorrhage in a child or adult is not to be ranked as hæmophilic, but it is only when a person shows a marked tendency to multiple hæmorrhage, spontaneous or traumatic, which tendency is not transitory but persists, and particularly if there have been joint affections, that we may consider the condition hæmophilia." In a later edition,[38] he says, "it is essential for the diagnosis that the individual should have been more or less subject to bleeding from various parts throughout life," and he quotes the opinion of Bullock and Fildes that "no solitary hæmorrhage however inexplicable should be regarded as hæmophilia, it is necessary to show that the individual has been repeatedly attacked, if not from birth, from infancy."

Any pulsations in the neighbourhood due to abnormal distribution or enlargement of blood vessels, *e.g.*, the ascending pharyngeal, should be carefully noted by a thorough examination of the throat before operation.

Every operated case should be within easy reach of the operator, for serious bleeding may take place at various stages, *e.g.*, hæmorrhage may be primary, *i.e.*, occurring at the time of operation; reactionary, occurring shortly after operation (in many cases being a continuation of the primary, or secondary, occurring some time afterwards). William Hill* has suggested that these stages should be defined in more detail.

1. *Primary hæmorrhage,* the most frequent form, occurring during operation and continuing after excision is effected.

2. *Early secondary, reactionary or delayed hæmorrhage,* as it is unhappily called by some, occurring within a few hours of the cessation of the non-serious primary operative bleeding.

3. *Recurrent secondary hæmorrhage.*—Several attacks occurring within the first few days (uncommon).

4. *Late, or true secondary hæmorrhage,* coming on about fifth to seventh day with separation of sloughs (very rare).

Preparation of patient for operation.—The operation of tonsillectomy is still looked upon by many practitioners in too light a manner, consequently small consideration in some cases is paid to ordinary surgical procedures. In all cases there should be a *period of preparation,* and this is equally as important as for a more serious operation. We should not forget that the general health of these patients is indifferent or bad, and that many are suffering from septic tonsils with toxic absorption and have low resisting power.

The administration of a *purgative* two days prior to the operation is better than the night before, since it avoids disturbing the patient on the morning of the operation. Rest for 12 hours before operation conduces to a placid nervous system, and consequent better vaso-motor control. It is advisable that smoking and alcohol should be prohibited for at least three or four days, and that only plain and light food should be taken for 24 hours, and nothing for four hours before the operation.

---

* By verbal communication to author.

The amount of bleeding which may occur appears to depend to a considerable extent on the technique of the operation and the skill of the operator. In no operation are the services of an expert anæsthetist of greater value, and the success of the operation may in no small way depend on his skill. Whatever anæsthetic is chosen, a clear respiratory passage should be assured, and an adequate intake of air maintained throughout the anæsthesia so as to avoid unnecessary congestion and increased blood pressure. In this connection, it is important that the tongue should not be allowed to fall backwards and obstruct the air passage. The passage of blood into the larynx, or stomach, during the operation, interfering with normal respiration and causing coughing, retching, or vomiting, should be prevented. The deep and dangerous chloroform anæsthesia considered necessary by some operators for the dissection method of enucleation, in order to reduce the hæmorrhage during operation so as to obtain a bloodless field, increases the risk of reactionary or secondary hæmorrhage.

PROPHYLACTIC TREATMENT.

Calcium lactate.—In those cases in which even moderate loss of blood is very undesirable, or when it is likely to be excessive, it may be advisable to administer calcium lactate for three days before operation in doses of from 10 to 30 grains twice a day. Almroth Wright[39] has shown that " the greatest acceleration of coagulation is obtained with one or two 15 grain doses; the effect may appear in three hours, reach its height in 24 hours, and last until the third day."

Adrenalin.—As previously stated, adrenalin predisposes to secondary hæmorrhage. Yankauer[40] maintains that " the use of adrenalin increases the liability to post-operative reactionary or delayed hæmorrhage, such hæmorrhages occurring about six hours after the operation." He says " adrenalin produces its characteristic ischæmia, not, as is erroneously supposed by some, by contracting the capillaries but by contracting the unstriped muscle fibres in the muscular coats of the small arteries. Such vessels are considerably larger than capillaries, and, when the effect of the adrenalin has passed away, the vessel wall is temporarily paralysed, and dilatation ensues. Unless a strong clot has formed in the terminal capillaries, hæmorrhage difficult to control is likely to occur."

PITUITRIN.

Citelli[41] has reported on the advantages of pituitary extract given subcutaneously in controlling hæmorrhage following turbinectomy, sinus operations, and tonsillectomy.

Kahn and Gordon[42] have made further investigations, and summarized their results in 50 cases of removal of tonsils and adenoids as follows :—

1. The blood loss was greatly reduced.
2. The coagulation-time of the blood was reduced from one-third to one-half or more after a hypodermic administration of pituitrin in doses of 12 minims to children and 15 minims to adults.
3. The coagulation-time was decreased within 15 minutes, and it remained so for over 24 hours.
4. Pituitrin increases the strength of the heart-beat, and decreases its frequency. It undoubtedly has a vasomotor constricting effect as well as a coagulating effect.

Gordon refers to one hæmophilic case in which the coagulation time was 15 minutes, and this was brought down to three minutes.

In these respects it has great advantages over calcium lactate, and can, therefore, be recommended as a prophylactic given 15 to 30 minutes before removal of the tonsils.

SERO-THERAPY.

The question of sero-therapy has been well summarized in a paper by Hall Forbes.[43] Subcutaneous injections of fresh blood serum have been found to possess a curative as well as a preventive value in the treatment of hæmophilic bleeding, purpura, and pernicious anæmia, by supplying the deficiency of fibrin ferment. By this means traumatic hæmorrhages in hæmophilics have been arrested.

Horse serum is said to yield more uniformly satisfactory results than any other animal serum. It may be given in doses of from 10 cc. to 25 cc., and its effect may be obtained in from 25 to 48 hours after the injections, and persists for at least three weeks. This point is of special importance in operative work on patients suffering from latent hæmophilia or from purpura.

Coagulose (hæmostatic ferment), a sterile soluble powder, prepared from the normal blood serum of the horse, contains the fibrine ferment necessary for coagulating blood, and may be used subcutaneously (0·65 gramme added to 6 or 8 cc. of sterile water—the equivalent of 10 cc. of blood serum) as well as locally in its powdered form as a styptic. It has been found useful by some observers as a prophylactic before operations on the throat.

Cecil Graham* uses horse serum given by the mouth as a routine practice, and advises that 10 cc. should be given in the evening before operation and another 10 cc. an hour after operation. In a case of hæmophilia, in which the coagulation time was found to be 15 minutes, he was able to reduce it to six minutes, in eight weeks, by means of horse serum and calcium lactate; he then enucleated the tonsils with Elphick's hæmostatic guillotine, the operation being almost bloodless. Hill* recently adopted these methods, after a three weeks' preparation, in an alleged hæmophilic boy; the immediate bleeding was much below normal, ceased with pressure, and there was no secondary hæmorrhage. The result, however, may have been mainly due to the use of the hæmostatic guillotine.

TREATMENT OF HÆMORRHAGE OCCURRING AT THE TIME OF OPERATION.

During the operation the bleeding may be brisk at first, for a few seconds, but it generally ceases spontaneously. After the first tonsil has been removed, any free bleeding which occurs should be controlled by the pressure of a sponge, or gauze swabs in the tonsillar bed, before the other tonsil is touched, and the patient's head, if lying on the back, should be turned over to the side so that any blood in the pharynx may run out of the corner of the mouth. The free use of ice or iced water at this time is very efficacious in controlling moderate bleeding and encouraging spontaneous stoppage, by quickly exciting contraction of the muscular coat of the vessels. The patient should not be removed from the table, until all bleeding points or oozing have stopped and the throat is practically dry. It is well to inspect the throat again the last thing before leaving the patient.

---

* By verbal communication to author.

THE TREATMENT OF HÆMORRHAGE OCCURRING AFTER OPERATION.

As previously stated, a reactionary hæmorrhage may be a continuation of a primary hæmorrhage. If it occurs after the primary bleeding at the operation has ceased, it generally comes on between three and six hours, though severe cases of secondary hæmorrhage, due to separation of sloughs, have been reported in which even 12 days have elapsed, but these are rare.

The most dangerous type of reactionary bleeding, which may lead to extreme exhaustion or death, is a slow persistent oozing from the entire surface of the wound, the blood being swallowed by the patient. In these cases very little blood may be seen on inspection of the throat, but the patient has recurring attacks of vomiting of large quantities of blood from the stomach. With this type of case a large clot is apt to form in the bed left by removal of the tonsil, which keeps the vessels from undergoing retraction. A portion of the clot may hang down the side of the pharynx like a wick, and not only keep up the bleeding, but also cause irritation, coughing, and expectoration, which increases the hæmorrhage. It is important when such a clot forms to remove it, for it generally accompanies and covers extensive capillary oozing. I have seen a number of cases in which the bleeding promptly stopped after removal of the clot. This clotting must not be confused with the normal clotting of blood in the severed vessels. With reactionary hæmorrhage a much larger total loss may occur, and these are the most serious cases. The loss of a pint of blood may cause much more pronounced effects in one individual than in another of the same age, sex, and general condition. Infants and young children bear any loss badly, and a relatively small loss may be fatal. As we should expect, the deaths from hæmorrhage following these operations are most common in the young.

In case the bleeding does not stop at the time of operation, or, having stopped, recurs later, the pharynx should be thoroughly inspected by means of an efficient headlight, and the tonsillar region cleared of blood by sponging. If hæmorrhage occurs from a spurting vessel, *e.g.*, the tonsillar artery, and if the bleeding point can be seen, it should be seized with long-handled artery forceps, and the vessel twisted or tied, or, if this is not possible, the forceps may be left in position. When the bleeding points are concealed under the faucial pillars, they are best found by retracting the anterior pillar with forceps or hook.

If the bleeding is general and cannot be specially localized, the firm pressure of a sponge under the thumb in the tonsillar bed, with the corresponding finger below the angle of the jaw, or on the vessels of the neck, and kept in position for 10 or 15 minutes, generally suffices to stop the bleeding. A hæmostat is recommended by some operators, so as to exert pressure on the tonsillar wound. The chief objection, however, to a clamp is that it causes great discomfort and distress to the patient, and gives rise to constant coughing and straining which may start bleeding from the opposite tonsillar bed. The hæmostat has been described as an old-fashioned and non-surgical method of controlling hæmorrhage. Harmon Smith[44] reports one case in which the hæmostat was kept in position for 16 hours with no recurrence of bleeding, and another in which bleeding recurred after the hæmostat had been in position for 21 hours necessitating its replacement, when it was left on for 47 hours, resulting in sloughing in the throat and necrosis of the tissues. He says considerable œdema of the cervical region may result.

HÆMOSTATICS.

Ice may be used as in primary hæmorrhage, but it is useful to a less extent in excessive late hæmorrhage.

The hypodermic injection of Morphia and Atropine is of great service in calming the nervous excitement and restlessness usually exhibited in these cases of hæmorrhage, prevents vomiting, and reduces the blood-pressure. Sleep should, therefore, be encouraged by this means. Morphia in doses of gr. $\frac{1}{12}$ to $\frac{1}{8}$ in children and $\frac{1}{6}$ to $\frac{1}{4}$ in adults will, in many cases, control persistent oozing if combined with atropine

$\frac{1}{250}$ to $\frac{1}{120}$ grain. That atropine acts as a hæmostatic is confirmed by Waugh[46] from collected reports. He refers to the prompt and powerful action of the drug in controlling various kinds of hæmorrhage, and especially its success in hæmophilic forms. J. B. Horgan[47] recommends an hypodermic injection of morph. sulph. gr. $\frac{1}{4}$ combined with ergot. citrat. gr. $\frac{1}{100}$, and states that out of nine cases of post-operative hæmorrhage, which occurred in 200 cases, in seven of these this injection was quite sufficient to stop the hæmorrhage.

Calcium Lactate.—In cases of post-operative hæmorrhage, it has been recommended to give calcium lactate or calcium chloride by the mouth or rectum, in 10 grain doses, in two ounces of water repeated hourly—40 to 60 grains being the maximum dose; but, as previously stated, its effects on coagulation are so slow, that it would appear useless to administer it for urgent post-operative hæmorrhage when an immediate effect is desired.

Adrenalin.—As previously stated, it predisposes to secondary hæmorrhage, so should be avoided.

Pituitrin.—Since an injection of 15 minims will rapidly (in 15 minutes) reduce the coagulation-time of the blood, it is recommended for urgent hæmorrhage. Donelan[48] states that he has used pituitrin preparations in six tonsillectomy cases, but considers that this method of checking hæmorrhage has no advantage over adrenalin, and is less certain either during or after operation. (*See* previous remarks on disadvantages of adrenalin, p. 346.)

Sero-therapy.—It is said that traumatic hæmorrhages have been arrested in hæmophilics by means of horse serum. L. M. Hurd[49] (N.Y.), however, reports a case of excessive bleeding in a man, aged 27, following removal of tonsils by dissection, in which both horse serum and coagulose were used, but without effect.

Saline Gelatine Solution.—A sterile saline gelatine solution has been recommended by Heymann (Leipzig) for subcutaneous injection into the flanks or gluteal region. It may be obtained in tubes (Martindale), each containing $\frac{1}{2}$ ounce, which should be added to $\frac{1}{2}$ pint of boiled water (making 2 per cent. solution) for one injection, at 103° F.

Chaput[50] (Paris) states that blood with a coagulation-time of seven minutes may be reduced to three minutes after an injection. The dose recommended is 5 grammes of gelatine in 1 per cent. solution. 5 to 7 cc. of gelatine solution (5 to 10 per cent.) containing 5 per cent. of calcium chloride has also been recommended.

Sachs[51] (Hamburg), however, reports the case of a boy, aged 10 years, from whom he removed tonsils and adenoids, and in whom profuse and uncontrollable bleeding followed, for which various styptics were used without success. Transfusion of physiological solution of sodium chloride, also with 2½ per cent. of gelatine was of no avail, and the child died four days later. It was afterwards ascertained that the child was a "bleeder."

Although sero-theraphy may accelerate the coagulation of the blood, it must not be forgotten that the endothelial lining of the intima, and an unusual thinness of the vessel walls by hæmophilia, probably play an important part in the bleeding by preventing formation of a clot. It is, therefore, important not to depend too much in such cases on coagulating the blood alone. Hæmostatics should be looked upon, in post-operative hæmorrhage, only as useful additions to compression which is the main treatment of hæmorrhage.

HÆMORRHAGE AND SYNCOPE.

Since the hæmorrhage in many of the reported cases has stopped when syncope came on, it has been recommended that fainting should be encouraged rather than hindered, and this is best done by sitting the patient up.

Harmon Smith,[52] however, reports six cases in which this failed. To depend on such a method, which necessitates producing syncope by encouraging loss of blood, is surely most unsurgical, especially when we have more satisfactory methods at our disposal.

LIGATION OF THE COMMON CAROTID ARTERY.

In extreme cases, it has been advised to ligature the common carotid, but in view of the free anastomosis of the various vessels which supply the tonsils, this line of treatment is not often successful and causes loss of valuable time. Cases are reported in which the hæmorrhage still persisted and the patient died. Delavan[53] shows conclusively that tying the common carotid is uncertain on account of the collateral circulation through the circle of Whillis, and that ligature of the external carotid, or of both the common and internal carotid, is necessary to shut off the blood supply from this region. Harmon Smith[54] considers that ligation of the external carotid is a serious sequence to such a simple operation as the removal of tonsils is supposed to be, and in many cases he says bleeding has still continued from the other carotid through its anastomosis. It has been shown that hæmostatics or astringents, in cases of serious bleeding, cannot be depended upon, the few cases of success reported being undoubtedly due to the accompanying pressure. Valuable time should not, therefore, be lost trying these remedies.

If sponge or forceps pressure fails to stop the bleeding, or if it recurs when once stopped, it is much better to waste no further time, but at once to suture the faucial pillars.

TEMPORARY SUTURING OF THE FAUCIAL PILLARS.

This has been recommended by some operators, but it has generally been described as an operation of considerable difficulty. The procedure, however, is much more simple than is generally supposed, provided the proper instruments are used; it usually requires a general anæsthetic, though occasionally, in a courageous adult, local anæsthesia may prove sufficient. With children an anæsthetic is absolutely necessary, and the same may be said in many cases of adults. The patient is placed in the recumbent position, with the head half-turned to the side, and a Doyen's gag inserted on one or other side of the mouth. A curved needle, attached to a long slender shaft, is all that is required—somewhat similar to those used in the cleft palate operation. I have had one specially made, which is suitable for all cases. It is, I think, easier to use than the tonsil suture instrument designed by Wagner for use with Michel's clips, which, apart from the pain attending their use, may cause considerable œdema, and increase the risk of sepsis by damaging the faucial pillars.

The instrument I recommend is really a half-circular needle, measuring ⅝ of an inch in diameter, with the eye close to the point, and set at an angle of about 45 degrees to a slender shaft 3¼ inches long, attached to a flat handle 4 inches in length (Fig. 4). This makes a very useful instrument, 7¼ inches in length. The important points are. the angle at which the needle is attached to the shaft, and its attachment to the long flat handle, which enables it to

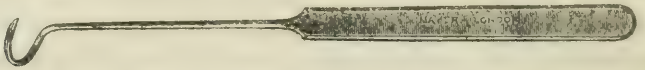


FIG. 4.—*Needle for suturing the faucial pillars.* The same needle can be used for either side.

be used without getting in the way of the lower jaw or the mouth gag, whilst the gag need not be changed from the position in which it was originally placed on either side.

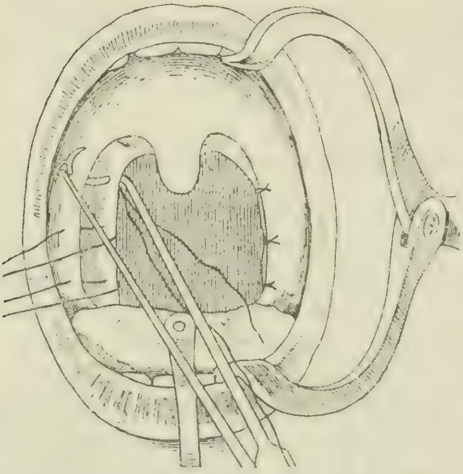


FIG. 5.—*The arrest of hæmorrhage after removal of the tonsils by temporary suturing of the faucial pillars. Shows the needle (threaded with a catgut suture) passed through the faucial pillars, also the method of securing and drawing the suture through the needle by means of a long hook.*

The needle should be threaded with silk or catgut ligature, 18 inches in length, and passed from behind, forwards, in the case of the right side, first through the posterior faucial pillar, and then through the anterior, about ¼ inch from their edges; whilst, in the case of the left side, the needle should be passed from before backwards, *i.e.*, first through the anterior and then through the posterior pillar.

The short end of the ligature is then caught by the hook (Fig. 6) at the eye of the needle and drawn through and out of the mouth, while the needle is withdrawn in the opposite direction over the remainder of the ligature. The two ends of the ligature are then in the position for tying, and may be secured before tying by artery forceps, while a second or third ligature is passed in a similar way. The tonsillar bed is then packed with a strip of 1-inch gauze by means of nasal dressing forceps, whilst each ligature is drawn together

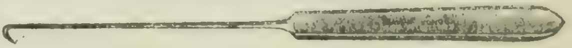


FIG. 6.—*Ligature hook.*

and tied by introducing the fingers deeply within the mouth, or by using a pair of forceps (Fig. 7) with circular extremities, through one ring of which the ligature is threaded, the tying can be accomplished more easily without the necessity of inserting the fingers in the mouth (Fig. 8). In most cases, it is quite sufficient to draw the pillars together without packing the tonsillar fossa.

The ligatures may be left undisturbed until they have been loosened by sloughing—if no gauze has been inserted in the fossa, but it is better that they should be removed in 12 hours to avoid the risk of retained sepsis, especially in those cases in which a gauze packing has been inserted in the tonsillar bed. The removal of the ligatures is facilitated, if they are left long and their ends attached by strapping to the outside of the cheek, for by pulling on them each knot can easily be cut with an angular pair of scissors.

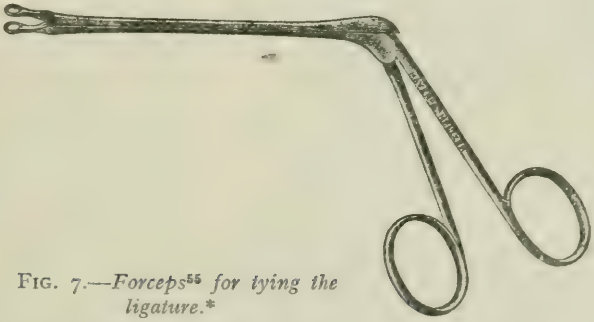


FIG. 7.—*Forceps*[55] *for tying the ligature.**

StClair Thomson[56] mentions the case of a hæmophilic (?) adult who was unfortunately operated on in his clinic; repeated hæmorrhages occurred, and were finally controlled by temporarily suturing the anterior and post-pillars together over a firm pencil of tightly rolled cotton wool. Luc[57] (Paris), in considering the danger of hæmorrhages in connection with this operation, goes somewhat to the extreme, and advocates the suturing of the pillars in all adults immediately after removing the tonsils—as a preventive measure. He says that, under such conditions, this suturing is easily performed, and gives the patient and the operator complete

* These forceps are the same as those I designed for intra-laryngeal work in the operation of laryngo-fissure, except that the blades are serrated for grasping the sutures.

security and tranquillity of mind.

A considerable number of other cases have been reported, in which the faucial pillars have been sutured before the hæmorrhage was controlled.

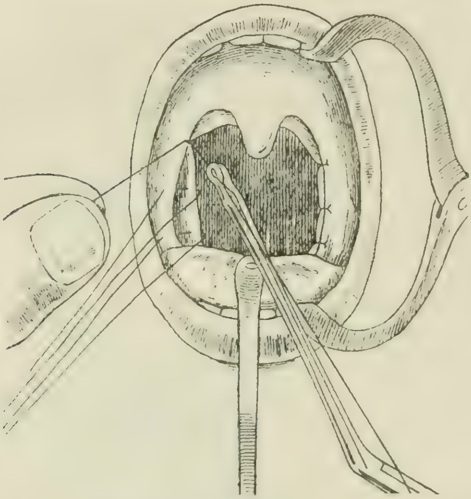


Fig. 8.—*The arrest of hæmorrhage after removal of the tonsils by temporary suturing of the faucial pillars. Showing how the ligatures may be tied by means of forceps, so avoiding the difficulty of introducing the fingers into the mouth.*

Many hæmorrhages occur owing to lack of attention to post-operative care. It is advisable, therefore, to keep constant observation for some time after operation. The patient should be placed in bed in the lateral position, so that if oozing does occur, the blood trickles into the cheek and out of the mouth, where it may be seen by the nurse, instead of into the stomach. Whilst the patient is recovering from the anæsthetic, a cork or bobbin placed between the teeth is useful in keeping the mouth open and preventing swallowing. Expectoration should be prevented, for, according to one writer, it may cause the sucking of the clot from the end of a severed vessel, and so encourage persistent bleeding. If a child is allowed to lie on its back, the blood may trickle into the stomach, and this may not be detected until the sudden vomiting of a large quantity of blood occurs, and the patient is found to be in a collapsed condition. If the patient looks pale, is restless with irregular, shallow, sighing breathing, and a rapid pulse, it is highly probable that bleeding is taking place. The nurse should, therefore, be instructed that her chief duty is to watch the movements of the larynx to see that the patient is not swallowing an appreciable quantity of blood. If the pulse is inclined to fail through loss of blood, it may readily be restored by the administration of a rectal saline. It should not be forgotten, however, that the increased blood-pressure caused by normal saline injection may re-open the vessels by washing away the newly formed clot, and so renew the hæmorrhage. The sight of blood from the throat unnerves the patient much more than would the equivalent amount from some other locality, and this upsets vaso-motor control; hence, when bleeding occurs, all receptacles used should frequently be renewed, and there should be no discussion before the patient as to the amount of blood lost. There is always, in these cases, a very free hyper-secretion of mucus and saliva, which added to the blood expectorated or vomited largely increases the bulk, and further alarms the patient or friends.

There should be good ventilation and plenty of cool fresh air in the sick room. Since hæmorrhage may be caused by exertion too soon after operation, *e.g.*, straining at stool, the importance of attention to the bowels must not be forgotten.

The patient should be kept in bed for 24 hours, and remain at home for from four days to a week. Cold or iced drinks are best for the first two or three days, and only food of soft consistence should be allowed. All hot, hard, or irritating articles of food should be strictly avoided, since they predispose to secondary hæmorrhage. Lennox Browne reported that the most troublesome case of hæmorrhage he ever saw was brought about by the irritation from a crumb of toast, and another case of a servant girl in whom bleeding occurred on the third day after removal of the tonsils, whilst she was kneeling and cleaning doorsteps.

The mouth should be kept clean with alkaline lotions or formalin lozenges. The wound usually heals in a week or 10 days, but if the tonsillar bed looks dirty or sloughy, it should be cleaned out by swabbing with peroxide of hydrogen 5 to 10 vols. per cent.

The various opinions expressed by different operators as to the frequency, or otherwise, of post-operative hæmorrhage, appears to support the view, that the amount of bleeding depends, to no small extent, on the technique of the operation and the skill of the operator, *e.g.*, in tonsillectomy with the guillotine clumsily performed in cases in which the anterior pillar of the fauces is stretched over the tonsil, or the tonsillar tissue is buried or adherent, there is danger of wounding the pillars and a vessel in this situation may be severed. Again, enucleation of the tonsils by dissection, if improperly or incompletely performed, may result in damage to the muscular fibres of the anterior or posterior pillars, or the superior constrictor of the pharynx, with resulting bleeding from the contained vessels. Post-operative hæmorrhage is frequently caused in this way. But the fact remains, that whatever operation is chosen or type of instrument used, even in the hands of the most skilful operator, cases will occasionally occur of troublesome hæmorrhage.

Though I have been most fortunate in having had only one case of alarming hæmorrhage amongst the many thousand tonsil operations I have performed, both in private and hospital practice (and this occurred since completing this article), I have had, however, during recent years, considerable experience in a number of cases to which I have been summoned in order to render assistance to my colleagues. In my own case, which occurred in a delicate anæmic boy, aged six years, in whom I completely enucleated both tonsils with the guillotine, extensive bleeding accompanied by vomiting of blood from the stomach came on two hours after operation, following an attack of coughing It was probably a continuation of a free primary hæmorrhage, which occurred at the time of operation and had apparently ceased. The right tonsillar fossa, from which the bleeding occurred, was found filled with a large clot disguising considerable leakage behind. On removal of the clot, together with sponge pressure for a few minutes and an injection of morphine $\frac{1}{12}$ gr. with atropine $\frac{1}{250}$ gr., the bleeding ceased. This child lost a large quantity of blood, and took many weeks to recover.

What has struck me most forcibly, in some of those cases which have come under my notice, is that serious bleeding would probably not have occurred, if more attention had been given before operation to the preparation of the patient, whilst in other cases there appeared to me to be a want of post-operative supervision and care. I have been much impressed with the heavy loss of blood, that is so frequently allowed to continue with the idea that it will sooner or later stop of its own accord, before definite steps are taken to stop it permanently; I have been surprised, too, at the considerable difference of opinion which appears to exist as to the best treatment in these cases of persistent or recurring hæmorrhage.

During the last five years, I have seen in consultation, and had part treatment of, 17 cases of serious or alarming hæmorrhage following the removal of tonsils; of these, seven occurred in the male adult, three in the female adult; five in male, and two in female children. With the exception of three adults, in whom I sutured the faucial pillars, all the rest were stopped by clearing away clots from the tonsillar bed followed by continuous sponge pressure, along with the hypodermic injection of morphia and atropine. In no case was there a history of bleeding, nor could any special bleeding point be found.

My object in writing this article is not to criticize the many methods and instruments used or the technique followed by different operators, but to draw attention to the important question of hæmorrhage and its control, and in this connection to advocate strongly *the early suturing of the faucial pillars* in all cases in which hæmorrhage continues after sponge pressure has failed to control the bleeding, and before the loss of blood has been sufficient to reduce the strength and damage the health of the patient.

That this contribution may prove sufficiently interesting to encourage the reporting of all really serious cases of tonsillar hæmorrhage is my earnest hope.

REFERENCES.

1 *Journ. Laryng. Rhinol and Otol.*, 1914, XXIX., pp. 545, 546. **2** *Laryngoscope*, 1904, XIV., p. 127. **3** *Diseases of Throat and Nose*, 1st edit., 1880, Vol. I., p. 72. **4** *The Throat and Nose and their Diseases*, 5th edit., 1899, p. 358. **5** *Trans. XVIIth Internat., Med. Cong. London*, 1913, Section XV., part I., p. 124. **6** *Journ. Laryngol. Rhinol. and Otol.*, 1914, XXIX., p. 186. **7** *Brit. Med. Journal*, 1893, II., p. 635. **8** *Dis. Throat and Ear Nose*, 3rd edit., 1900, p. 61. **9** Cited by Shurly, *Diseases of Throat and Nose*, 1st edit., 1900, p. 413. **10** Quoted by Leipziger, *Iowa Med. Fortnightly*, September 10, 1902. Abstract, *Laryngoscope*, 1903, XIII., p. 169. **11** *Trans. Amer. Laryngol. Rhinol and Otol. Soc.*, 1909, XV., p. 162. Abstract, "*Laryngoscope*," 1912, XXII., p. 140. **12** *Monatsschr. f. Ohrenh.*, 1909, XLIII., p. 721. **13** *Zeits. f. Laryngol. Rhinol.*, 1911, III., p. 477. **14** *Proc. New York Acad. Med.*, February 29, 1912. Abstract, "*Laryngoscope*," 1912, XXII., p. 1140. **15** *Laryngoscope*, 1912, XXII., p. 757. **16** *Boston Med. and Surg. Journ.*, 1911, CLXIV., p. 119. **17** *Trans. XVIIth Internat. Med. Cong. Lond.*, 1913 (Laryngol. Section), p. 182. **18** *Trans. XVIIth Internat. Med. Cong. Lond.*, 1913 (Laryngol. Section), p. 181. **19** *Ibid.*, p. 182. **20** *Ibid.*, p. 180. **21** *Ibid.*, p. 172. **22** *Ibid.*, p. 181. **23** *Ibid.*, p. 182. **24** *Journ. of Laryngol. Rhinol. and Otol.*, 1914, XIX., pp. 545, 556. **25** *Disease Nose, Throat and Ear*, 1st edit., 1908, p. 374. **26** Fetterolf: "The Anatomy and Relations of the Tonsils," *Amer. Journ. Med. Sc.*, 192, CXLIV., pp. 51, 52, also *Morris's Anatomy*, 1915, p. 1133. **27** *Proc. Roy. Soc. Med.*, 1914, VII. (Laryngol. Sect.), p. 25. **28** *Journ. Laryngol. Rhinol and Otol.*, 1915, XXX., p. 134. **29** *Proc. Roy. Soc. Med.*, 1914, VII. (Laryngol. Sect.), p. 26. **30** Quoted by Morell Mackenzie, *Diseases of Pharynx, Larynx, and Trachea*, 1880, I., p 54. **31** *Boston Med. and Surg. Journ.*, 1911, CLXIV., p. 414. **32** *Proc. Roy. Soc. Med.*, 1914, VII. (Laryngol. Sect.), p. 104. **33** Discussion on H. J. Davis's case, *op. cit.*, p. 104. **34** *Journ. Laryngol. Rhinol. and Otol.*, 1914, XXIX., p. 186, **35** *Lancet*, 1915, ii., p. 128. Abstract *Journ. Laryngol. Rhinol. and Otol.*, 1915, XXX., p. 416. **36** *Proc. Roy. Soc. Med.*, 1914, VIII. (Laryngol. Sect.), p. 48. **37** *Principles and Practice of Medicine*, 4th edit., 1901, p. 820. **38** *Ibid.*, 8th edit., 1917, p. 766. **39** *Brit. Med. Journ.* 1893, II., p. 223. **40** *Laryngoscope*, 1909, XIX., p. 337. **41** *Trans. XVIIth Internat. Med. Cong. Lond.*, 1913, Sect. XV., XVI., p. 283. **42** *Annals of Otol. Rhin. and Laryngol.*, 1915, XXIV., pp. 322–326, 404–410 **43** "Treatment of Hæmorrhage with Normal Blood Serum," *Ann. Otol. Rhinol. and Laryngol.*, 1916, XXV., pp. 145–156. **44** *Laryngoscope*, 1904, XIV., p. 121. **45** *The Throat and Nose and their Diseases*, 1st edit., 1889, pp. 358, 359. **46** *Med. Rec. N.Y.*, 1909, LXXVI., p. 905. **47** *Journ. of Laryngol. Rhinol. and Otol.*, 1915, XXX., p. 482. **48** *Journ. of Laryngol. Rhinol. and Otol.*, 1913, XXVIII., p. 353. **49** *Laryngoscope*, 1915, XXV., pp. 856–859. **50** *Lancet*, 1908, II., p. 1782. **51** *Journ. Laryngol. Rhinol. and Otol.*, 1900, XV., pp. 61, 62. **52** "Surgical Pathology of Hæmorrhage after Tonsillotomy," *Trans. Amer. Laryngol. Assoc.*, 1888, X., p. 153. **53** "Surgical Pathology of Hæmorrhage after Tonsillotomy," *Trans. Amer. Laryng. Assoc.*, 1888, X., p. 153. **54** *Laryngoscope*, 1904, XIV., p. 121. **55** Irwin Moore : "The Operation of Laryngo Fissure. Some New Instruments specially designed for improving the Technique." *Lancet*, 1916, II., p. 675. **56** *Diseases of Nose and Throat*, 2nd edit., 1916, p. 398. **57** *Trans. XVIIth Internat. Med. Cong. Lond.*, 1913 Sect. IV., part i., p. 181.

ADDITIONAL REFERENCES

Ballenger, W. L. (Illinois) : *Diseases of the Nose, Throat and Ear*, 4th edit., 1914. **Barnes, Harry A.** (Boston). *The Tonsils, Faucial, Lingual and Pharyngeal*, 1914. **Bosworth, F. H.** (New York) : *Diseases of the Nose and Throat*, 3rd edit., 1897. **Bulson, Albert E.** (Fort Wayne) : "Alarming Hæmorrhage following Excision of the Tonsils and Adenoids."—*Laryngoscope*, 1903, XIII., pp. 219–221. **Brown-Price, J.** (Toronto) : *Diseases of the Nose and Throat*, 1901. **Chamberlin, Wm. B.** (Cleveland) :—"Some Practical Points in the Total Extirpation of the Tonsils," Abstract *Laryngoscope*, 1910, XX., pp. 903–910. **Chaput** (Paris) : "The Treatment of Hæmorrhage by Subcutaneous Injection of Gelatine," *Bull. et Mem. Soc. Méd. des Hôpitaux*, 1908, Series III., 26, p. 629. **Citelli, Prof.** (Florence) : "La Pituitrine dans les Hémorragies opératoires et spontanées des voies respiratoires." *Trans. XVIIth Internat. Congress Med.*, London, 1913, Sect. XV. and XVI., pp. 283, 284. **Coakley, C. G.** (New York) : *Diseases of the Nose and Throat*, 4th edit., 1908, Part II. **Cocks, G. H.** (New York) : *Proc. N. Y. Acad. of Med.*, February 28, 1912, Abstract *Laryngoscope*, 1912, XXII., p. 1140. **Donelan, J.** : "A Critical Note on the Value of Pituitrine Preparations in reducing Operation or post-operative Hæmorrhage." *Journ. Laryngol. Rhinol. and Otol.*, 1913, XXVIII., p. 353. **Cohen, J. Solis** (Philadelphia) : *Diseases of the Throat*, 1872. **Cohen L.** (Baltimore) : "Postoperative Tonsillar Bleeding." *Journ. Amer. Med. Assoc.*, 1909, LIII., pp. 698–701. "Routine Use of Ligature in Tonsillar Bleeding with Description of Technic." *Laryngoscope*, 1910, XX., p. 893. **Delavan, D. B.** (New York) : *Laryngoscope*, 1910, XX., p. 767. **Dufour, C. R.** (Washington) : "Hæmorrhage following Tonsillotomy with Cold Wire Snare," *Laryngoscope*, 1908 XVIII., p. 385. **Elphick, Geo.** : "Employment of the Hæmostatic Guillotine for minimising Hæmorrhage in complete Enucleation of the Tonsils." *The Medical Press*, 1915, Vol. I., p. 547. **Fetterolf, Geo.** (Pennsylvania) :

"The Anatomy and Relations of the Tonsils." *Amer. Journ. Med. Sc.*, 1912, CXLIV., pp. 51, 52. **Fisher, A. G. Timbrell**: "Sigmoid Tortuosity of the Internal Carotid Artery and its Relation to Tonsil and Pharynx," *Lancet*, 1915, II., p. 128. Abstract *Journ. Laryngol, Rhinol and Otol.*, 1915. XXX., p. 416. **Friedrich, E. P.** (Leipsig): *Rhinology, Laryngology and Otology and their Significance in General Medicine*, 1900. **Garland, E., and D. C. Greene** (Boston): "Hæmorrhage following Tonsillectomy," *Boston Med. and Surg. Journ.*, 1914, CLXX., p. 525. **Gibb, Joseph S.** (Philadelphia): "Some Observations upon the complete Extirpation of the diseased Faucial Tonsils," *Trans. Amer. Laryngol. Assoc.*, 1909, p. 191. **Goodale, T. L.** (Boston): "Indications for and relative Values of Tonsillotomy and Tonsillectomy," *Boston Med. and Surg. Journal*, 1913, CLXIX., pp. 485–492. **Ingals, E. Fletcher** (Illinois): *Diseases of the Chest, Throat and Nasal Cavities*, 3rd edit., 1895. **Kann and Gordon** (Chicago): "The Use of Pituitary Extract as a Coagulant in the Surgery of the Nose and Throat," *Ann. of Otol. Rhin. and Laryngol*, 1915, XXIV., pp. 322–326. **Kelly, A. Brown**: "Large Pulsating Vessels in the Pharynx," *Glasgow Med. Journ.*, January, 1898. **Kyle, D. Braden** (Philadelphia): *A Text Book of Diseases of the Nose and Throat*, 4th edit., 1907. **Mackenzie, Morell**: *Diseases of the Throat and Nose*, Vol. I., 1880. **McBride, P.** (Edinburgh): *Diseases of the Throat, Nose and Ear*, 3rd edit., 1900. *Morris's Anatomy*: 5th edit., 1915. **Newcomb, James F.** (New York): "Personal Experiences with Tonsillar Hæmorrhage," *Proc. New York Acad. Med.*, January 10, 1910, Abstract *Laryngoscope*, 1910, XX., p. 670. **Packard, F. R.** (Philadelphia): "Personal Experience in Tonsil and Adenoid Work," *Proc. New York Acad. Med.* (Sect. Laryngol.), January 10, 1910. Abstract *Laryngoscope*, 1910, XX., p. 670. Also a "Study of the fatal Results of Operation upon the Nose and Throat," *Laryngoscope*, 1904, XIV., p. 683. **Pierce, Norval H.** (Washington): "Removal of Tonsils," *Journ. Amer. Med. Assoc.*, 1909, LIII., p. 692. **Pynchon, E.** (Chicago): "Treatment of post-operative Hæmorrhage," *Laryngoscope*, 1909, XIX., p. 431. *Quain's Anatomy*, 11th edit., 1908. **Richards, G. L.** (Mass.): "The present state of the Tonsil Operation; its indication and the various Methods in use," *Trans. Amer. Laryngol. Rhin. and Otol. Soc.*, 1910, June 3, p. 162, Abstract *Laryngoscope*, 1910, XX., p. 160. **Santi, Philip de**: "Hæmorrhage following Tonsillotomy. Its Cause and appropriate Treatment," *Lancet*, 1894, I., pp. 83–86. **Schech, Philip** (Munich): *Diseases of the Mouth, Throat and Nose*, 1st edit., 1886. **Shurley, Ernest L.** (Detroit): *A Treatise on Diseases of the Nose and Throat*, 1st edit., 1900. **Sluder, Greenfield** (St. Louis): "A Method of Tonsillectomy," *Journ. Amer. Med. Assoc.*, 1913, LX., pp. 650–654. **Stein, Otto J.**: (Chicago): "A Case of Severe Primary Hæmorrhage following the Removal of the Faucial Tonsil," *Laryngoscope*, 1908, XVIII., p. 387. **Stucky, J. A.** (Lexington): "Some untoward after-effects of the too radical Tonsillectomy," Abstract *Laryngoscope*, 1912, XXII., p. 1201. **Smith, Harmon** (New York): "Alarming Hæmorrhage following Tonsillotomy; its Cause and Cure." Read before the Laryngol. Sect. New York Acad. Med., December 23, 1903, Abstract *Laryngoscope*, 1904, XIV., p. 121. **Thomson, StClair**: *Diseases of the Nose and Throat*, 2nd edit., 1916. **Waugh, Geo. L.**: "The Surgical Treatment of Diseased Tonsils," *Medical Magazine*, 1910, XIX., p. 259. Also *Lancet*, 1909, I., p. 1314. **Whillis, Samuel S., and Frederick C. Pybus**: "On the Enucleation of Tonsils with the Guillotine," *Brit. Med. Journ.*, 1911, II., pp. 1402–1404. **Wilson, N. L.** (New York): "Observations on Tonsillotomy," *Proc. New York Acad. Med.* (*Laryngol. Sect.*), December 22, 1903, Abstract *Laryngoscope*, 1910, XX., p. 576. **Wright, Jonathan** (New York): Discussion on Harmon Smith's Paper, *Laryngoscope*, 1904, XIV., p. 136. **Yankauer** (New York): "Tonsillectomy" *Laryngoscope*, 1909, XIX., p. 329.

PRO-ETHER.

By DONALD J. MUNRO, M.D.

Surgeon (Temporary), Royal Navy; Anæsthetist to the Royal Naval Hospital Portland; Hon. Anæsthetist, the Throat Hospital, and Belgrave Hospital for Children.

THE members of the Anæsthetists' Section of the Royal Society of Medicine have recently issued a joint condemnation of the extensive and extending use of chloroform in military hospitals. Their attitude must meet with the sympathetic approval of all professed anæsthetists, albeit not privileged to add their votes on the occasion mentioned, and the object of this little article is to assist in driving another nail into the coffin of chloroform, as a drug of routine use, since even the weight of a grain of unconsidered sand has its value when added to the impact of an authoritative sledge hammer. The protest should, indeed, be extended to all anæsthetic practice, and not be confined to that of the military hospitals.

"That is all very well," says the practitioner who gives an anæsthetic but seldom, "but to my mind the advantages of chloroform outweigh its drawbacks. It is portable, pleasant, easy to give, and I am used to it and understand it."

Mr. Jacobson used to say, that, when an anæsthetic—any anæsthetic—is given, the patient is taken to the edge of the grave, and a few feet down it, "and you cannot always be sure of bringing him back, sir." This so forcibly sketches the whole duty of the anæsthetist, that it remains scarcely necessary to point out the fallacies in the unpractised practitioner's position.

It is obvious that ease, *savoir-faire,* and success in giving anæsthetics must, very largely indeed, depend upon practice, and upon the frequency with which they are given; on that very ground, the frequent use of chloroform in warfare stands absolutely and irrevocably condemned. No medical man, who has such golden opportunities of learning the art of giving ether, has any justification whatsoever for persisting in his adherence to chloroform as his drug of election. Should not the circumstance be enough to convince all such inexperienced administrators, that there is no professed anæsthetist who upholds chloroform against ether? This applies to all England and all America, the countries which lead the world in the study and use of the narcotic drugs in surgery.

The argument that ether is less portable than chloroform must be granted; as well as that it tends to evaporate when badly packed; but it does not become dangerous in keeping, whereas all sorts of elaborate precautions, in respect of darkness, special tint of bottle-glass, and temperature, have to be employed to rob chloroform of some, only, of its noxious properties. It is sheer nonsense to object to the more or less elaborate apparatus required in order to give ether satisfactorily, because no "pukka" anæsthetist would ever, if he could help it, give chloroform either, without the help of one or other of the equally elaborate instruments devised for the taming of that savage drug; without instruction or example the use of Vernon Harcourt's or Shipway's apparatus for chloroform is not one whit easier than the use of the "Clover" for ether.

Passing over the boast of the hypothetical practitioner, that he uses chloroform because he "understands it," with the casual denial that he certainly does not, for nobody does, and omitting the consideration of facts and theories which may, in time, bring to us such understanding, I will describe a method of giving ether, which, though new only in minor details, is yet very little used, though it is thoroughly satisfactory in almost all applicable cases. The mention of details brings up the indispensable condition, on which the greatest stress must be laid, first, last, and all the time, that close and untiring vigilance with constant attention to all details must be maintained throughout the anæsthesia; while this is absolutely needful to save the patient's life under chloroform, it is just as necessary under ether, but only in order to make the administration successful as anæsthesia. It is, in fact, vigilance that makes the anæsthetist, for the great majority of "unaccountable" deaths have taken place while the anæsthetist has been talking to the surgeon or otherwise neglecting his duty.

The apparatus, which can be used—unless ether is contra-indicated—for every operation on the human body, excepting those which directly involve the cavities of the nose and mouth, is simply a modern " wide bore " " Clover's " inhaler, fitted or modified with four essential details :

(1) Elliptical, not triangular facepieces. (*Note.*—Facepieces slightly too large are far better than those which are too small.)
(2) Air pads, with the inflated portion coming squarely under the edge of the facepiece all round.
(3) The bag applied by an angle-mount and cage; the ring-mount with straight cross-wires is an abomination when in use.
(4) The angle on the mount pierced by a tap, leading through a narrow internal tube straight into the bag. This is endlessly useful, not only for economical induction with nitrous oxide, but also for giving oxygen when requisite.

The facepiece is fitted in such a way that the filling port in the " kettle " comes uppermost when the patient's head is turned to the right, thus obviating the necessity for removing the apparatus from the face in order to recharge it—a point of great importance in " alcoholics." The first charge is two ounces of ether in hot weather, and one ounce in cold. The recharges consist always in half an ounce or less, the first being added towards the end of induction, and after that every 10 or 15 minutes or less frequently, according to circumstances. The fitted and charged apparatus, *without the bag*, is applied gently to the patient's face, " from the eyebrows downwards," and he is asked if it is comfortable and reassured by a few words of professional " patter," the indicating lever being kept severely at " 0." If the moment is seized so that he expires through the inhaler before taking an inspiration, he will perceive no taste of ether—if the inhaler is faultless.

He is now directed not to hold his breath on any account, and his expirations are caught in the bag, lightly applied and lifted again during inspiration. From this point until the patient is "over," *nobody in the room is to speak a word.* I do not give the reasons for all these seemingly complicated details, for if any administrator consciously omits one of them he will very promptly and certainly find out the reason for himself.

When the bag is about half full of the patient's own expired breath, the angle-mount is gently pressed home on the top of the kettle. The patient now breathes in-and-out of the bag; the inhaler is lifted clear for the sixth inspiration and the eleventh, which are "breaths of air," the expirations being caught in the bag as before. Meantime the ether is being turned on, beginning at the third in-and-out breath; the space in the orbit of the indicator between the marks "0" and "¼" is divided into ten imaginary parts, and the lever is moved through one of these tenths at each breath of the patient. There is a pause for two breaths at "¼," and then at every second breath the lever is moved *one quarter* of the distance between "¼" and "½," If he can breathe "½" strength vapour without coughing, the speed of advance can be increased and the lever moved *half* the distance from "½" to "¾" and from "¾" to "FULL" at each second breath of the next eight breaths, and *then* the *third* breath of air is given. Coughing on the patient's part makes it necessary to advance the lever more slowly or, better, to move it back sharply for one fourth of the arc, and then to begin moving it forward again. Retching or struggling are both treated by "pressing" the vapour, by advancing the lever more rapidly. With the lever advanced to "full" and the third breath of air allowed, no more air is to be given for 10 to 15 breaths; by this time, in nearly every case, the conjunctival reflex will be gone, and the patient may be moved into the theatre. After from 10 to 20 more in-and-out breaths, the corneal reflex will be gone too, the pupil remaining small and active to light, and the breathing will be "automatic" in rhythm, that is, regular and deep and only slightly quicker than the breathing of normal sleep. Anæsthesia is now complete, and is deep enough for most operations; even for perineal and rectal surgery, it need only be pushed beyond this stage until the limbs just become flaccid, a point which coincides with partial dilatation of the pupils, and this depth of anæsthesia seldom requires to be maintained for any length of time after the skin incision has been made or the sphincter stretched.

Anæsthesia, being obtained, is then maintained very comfortably by giving a full breath of air at every fifth inspiration, carefully continuing to catch the expirations, unless the bag becomes distended, which seldom happens, and at the same time the indicator is to be moved back little by little towards and even to and beyond the "½" mark, since few patients need as much vapour to keep them asleep as to put them to sleep. Thereafter, during the continuance of the operation, there is no need to test the corneal reflex; an occasional glance at the eye is all that is necessary to make sure that the cornea is bright and the pupil small, while the depth of the anæsthesia may be gauged accurately by the character of the breathing. This remains regular and "automatic" so long as all is well, it grows more rapid, with dilatation of the pupil, if the patient is "going over" needlessly deeply, and it becomes shallower and irregular, again with dilatation of the pupil, and usually also with swallowing movements of the larynx, if the anæsthesia is becoming too light. The former deviation calls for less vapour and more air, the latter for a fresh recharge in the kettle, and a stronger vapour for a few breaths.

This method of inducing and maintaining ether anæsthesia differs in its details slightly but vitally from the original Clover's method, but differs profoundly in the results. The Clover method aimed at cyanosis, stertor, and a widely dilated pupil, all of which are now regarded as signs of overdose, and are sedulously to be avoided. On the contrary, the method described here results in a decidedly light type of anæsthesia, in a *pink* patient. The lightness of the anæsthesia has only one drawback, in my experience, and that is a slightly increased tendency to produce "ether clonus," which appears to be especially the case in naval and military patients. This complication is apparently the peripheral myopathy which corresponds with fibrillation of a diseased heart-muscle, and mostly occurs in patients whose muscles have been trained to "staleness" and have then undergone more or less disuse through confinement, either on board ship, or to bed after being wounded. The method is a compromise amongst, and presents all the virtues of, the closed, the open, and the warmed-vapour methods. The routine use of atropine (gr. $\frac{1}{100}$, or gr. $\frac{1}{150}$ in patients below 20 years) does away with salivation, and the patient remains pink throughout, comes round very quickly, and is very rarely sick. It is practically only in case of deformity of the jaws, that there is any need for wedge, gag mouth-prop, or artificial airway, though these accessories must be always at hand. The tongue-clip is not needed twice in a hundred cases, and, unless specially indicated, or in very long operations, oxygen is only called for occasionally to help a muscular spasm to relax —*e.g.*, in appendicitis.

The modification of the method required, when "gas and ether" is chosen as "more pleasant," is extremely slight and simple. The rubber tube from the gas-cylinder-union is brought direct to the tap on the angle mount, and the nitrous oxide is used in place of the patient's own expired air, while the ether is turned on by greater increments and therefore more rapidly. The greater pleasantness and slightly accelerated induction under "gas and ether" are more than counterbalanced, in my opinion, by the invariable and irritating cyanosis and the greater tendency to struggling and rigidity.

Lastly, but quite important, in nearly all those cases in which the anæsthetist must carry on with chloroform, either on account of locality, as in mouth and nose operations, or because the slightly greater hæmorrhage due to ether would embarrass the surgeon, as in operations on the brain, it is an excellent policy to induce anæsthesia with ether, for this so stimulates the heart that the subsequent poisoning of that organ by (even light) chloroform anæsthesia is not nearly so pronounced or depressing as it otherwise would be.

It may not be amiss to conclude by stating my belief, that C.E. and A.C.E. mixtures require quite extraordinary caution in use, even by professed anæsthetists. These mixtures are even more dangerous in reality than chloroform, because their ether-content tends to create an entirely false sense of security, which may haply lead the unwary into a fool's paradise.

IMPETIGO CONTAGIOSA AS A POSSIBLE CAUSE OF ACUTE NEPHRITIS.

By W. FLETCHER STIELL M.R.C.S., L.R.C.P.

Resident Medical Officer, County Hospital, Lincoln.

WITHIN recent months I have become more convinced that many of the cases of acute nephritis, for which formerly no definite causative factor could be assigned, are in reality a complication to an ordinary attack of contagious impetigo.

When we consider that acute impetigo contagiosa is simply the result of an accidental inoculation of the streptococcus pyogenes beneath the skin, it is not very surprising to find that this disease can be followed by a nephritis, identical with that following scarlatina. If we admit that scarlatina is itself a streptococcal septicæmia, with a primary seat of infection in the tonsils or lungs, then, even if there is some slight difference in the actual strain and virulence of the organism and its mode of inoculation, there can be little argument that there is a close association in the causation of both impetigo and scarlatina.

From my own observations, I am inclined to think that not only is true streptococcal impetigo contagious but also infectious. Recently into one of our children's wards, I was obliged to admit a child suffering from intussusception and acute impetigo. In spite of the most rigorous precautions against direct contagion from fomites, clothing, nurses' hands, etc., within three days there were two further cases of impetigo in the ward, and within seven days every occupant of the ward was under treatment for the condition. During this epidemic of the disease the occurrence of nephritis as a possible complication was not considered, and consequently no useful notes of the routine urine tests were made.

For the appearance of an acute nephritis in the course of a case of impetigo, it is not at all necessary to obtain any definite signs of a generalized streptococcal septicæmia. Here, again, the condition is not unlike a scarlatinal nephritis, in which condition the albuminuria generally manifests itself for the first time at least a week after all pyrexia has vanished, and presumably septicæmia has subsided.

In my records of five cases of nephritis complicating acute impetigo, I acknowledge that one case did display an undoubted "surgical scarlatina," but in this case it is worthy of note that, beyond the rash, slight pyrexia, and desquamation, there were none of the other typical clinical signs of true scarlatina. Personally, I always consider that "surgical scarlatina" and ordinary scarlatina are one and the same disease, the sole difference being the mode of entrance of the offending organism into the general circulation.

I wish to give a brief outline of the five cases of acute nephritis resulting from typical impetigo contagiosa, which have come under my notice within the last five months—

CASE 1.—A boy, æt. 5 years, had been under treatment for seven days as an out-patient for typical impetigo contagiosa of the face. A week after the skin complaint had been successfully treated, the child was again brought to the hospital with generalized anasarca and definite ascites. On admission, the albumen in the urine was eight grammes to a litre and of the ascitic fluid one gramme to a litre. Under treatment on ordinary lines for an acute nephritis, the child's condition failed to improve, and he died within eight days from œdema of the lungs. An autopsy was performed, and a careful examination of the kidneys made. Beyond a slight increase in the cortical zone and some hyperæmia, there appeared no definite macroscopical changes and the capsule was not adherent. Histologically, however, the changes were those of an acute glomerular nephritis combined with an incipient cellular infiltration into the interstitium. Tubular changes were not very pronounced.

CASE 2 was that of a soldier who was admitted into hospital in France suffering from "inflammation of connective tissue" of both legs. A week later, while in the same hospital, œdema of the face was noticed, and a urine test gave the presence of albumen, blood, and casts. He was consequently transferred to England with a diagnosis of "trench nephritis." On admission into the Lincoln County Hospital, he was found to be suffering from a typical acute impetigo of the legs, which was probably secondary to a relieved pediculosis corporis. At this time the urine contained five grammes of albumen to a litre. After eight weeks of treatment, the patient was again transferred to a convalescent hospital with only "a trace of albumen" in the urine and on a full diet. From this it would appear possible that many of our cases of so-called "trench nephritis" may similarly be a direct complication of a streptococcal dermatitis, combined, in many instances, with such predisposing factors as chill and exposure.

Case 3.—A child, æt. seven years, was admitted into hospital suffering from a generalized anasarca, ascites, and an acute impetigo contagiosa of the face. At the time of admission the urine showed eight grammes of albumen to the litre, blood cells, and granular casts. The specific gravity was 1,028, and the quantity of urine passed was diminished to ten ounces in 24 hours. Two days after admission, a diffuse scarlatiniform rash was present, but, beyond a slight rise of temperature, there were no other characteristic signs of true scarlatina, and no other cases of this disease subsequently developed in the ward, which at the time was occupied by eleven other children. The treatment in this case consisted of a milk and farinaceous regimen, hot-air baths daily, and a mixture containing tinct. digitalis and diuretin, which was later replaced by the ordinary Basham's mixture, combined with pil. digitalis co. at nights. The facial impetigo was rapidly cured by removal of the scabs with a lotion of $\frac{1}{4000}$ hydrarg. perchlor., followed by an inunction of ung. hydrargyri nitratis dilutum. After nine weeks of treatment, all œdema and ascites had resolved, and the child was discharged from hospital.

Condition of urine on discharge: S. g. 1,012, reaction acid. No blood cells or casts present. Albumen, half gramme to a litre.

Case 4.—A boy, æt. 8 years, was admitted into hospital on October 14, 1917 in a condition of extreme generalized anasarca. He was at the same time suffering from considerable ascites and double hydrothorax. The parents stated, that about three weeks previously the child had been suffering from "sores and spots on the face." At the time of admission, there was no active impetigo, but numerous straw-coloured areas about the face and scalp, combined with a resolving adenitis of the mastoid, pre-auricular, occipital, and superficial cervical lymph nodes, afforded sufficient evidence that there had been a fairly severe impetigo within a recent date. This case was an unsatisfactory one throughout. For the first two days after admission, there was a complete suppression of urine combined with a threatened uræmia. Paracentesis abdominis was immediately performed, and four pints of fluid removed. Under brisk treatment, on lines similar to those for a scarlatinic nephritis, the kidneys were eventually stimulated to act inefficiently. The urinary examination of the first specimen obtained was: Sp.g. 1,025; reaction, acid; no sugar, no pus cells; blood cells and granular casts present; albumen, 14 grammes per litre, equal to 1·4 per cent. or 6·125 grains per ounce. The albumen contained in the ascitic fluid, on the three occasions on which it was found necessary to perform paracentesis, remained practically constant and low throughout, never rising above ·5 gramme per litre. This case has so far progressed unfavourably, and, although the kidneys are now excreting 15 ounces of urine daily and symptoms of uræmia are absent, there is still a very decided anasarca and the albuminimeter still records twelve grammes of albumen per litre.

Case 5 was one of a child æt. 5 years, who had been under treatment for a week as an out-patient with typical impetigo contagiosa of the face and scalp. Five days after this skin trouble had been cured, the child was again brought to the hospital with swelling of the face, legs, and scrotum There were occasional attacks of vomiting, but no pyrexia. After four weeks of treatment the albuminuria had fallen from five grammes in a litre to one gramme in a litre, and the child was discharged from hospital in a satisfactory and still improving condition.

From an analysis of these five cases, it seems probable that an acute streptococcal impetigo is capable of producing an acute nephritis, every bit as severe as that following an ordinary attack of scarlatina. I do not mean to suggest that every case of impetigo subsequently develops nephritis as a complication, but, at the same time, I do consider that the risk of this occurrence, even in efficiently treated cases, is quite as great as in scarlatina, and I also think that impetigo is frequently the explanation of many of the sudden and acute cases of nephritis, occurring in children, for which formerly there has been no satisfactory explanation. In a similar manner it is possible that many of the cases of so-called " trench nephritis " in soldiers are, in fact, a complication either of an impetiginous pediculosis or an impetiginous scabies. At the time of writing this article, it is worthy of note that military cases of nephritis have now become notifiable as a " contagious disease." It would be interesting to know whether it is the actual nephritis, which is to be considered as contagious, or whether it is the " cause " of the nephritis which has made this notification desirable.

MASTURBATION.

By JAMES HEPBURN, M.B., C.M., Capt. R.A.M.C.

There exists a disease (if such it may be called) which, as far as I know, is little studied, seldom mentioned, and withal is more prevalent than most people imagine. Generally speaking, the disease is intimately connected with sex problems. Nobody is more disinclined to write about these subjects than the author of this article, but the disease and results of this practice of self-abuse have been so brought home to me, that, after studying and treating several cases, I feel constrained to give the results of investigation, to attempt to show the causes, and outline the treatment I have adopted.

When one elicits the history of this most objectionable practice, one finds that it begins in childhood at or just about puberty—from the ages of from 11 to 15 years. The patients one is called on to treat may roughly be divided into two classes.

First, the type of person who has a highly sensitive nature; he is generally refined, with high thoughts and ideals, but there is a curious lack of will-power in this one direction. He often holds a good and responsible position in life, is unmarried, and being heartily ashamed of his weakness, wishes advice and treatment so that he may be able to overcome this unnatural proclivity.

Second, the type whose whole moral nature is on a very low level, who indulges in all kinds of moral depravity, whose thoughts are morbid, and whose character is bestial. Men of this type are usually small, puny, and unhealthy looking, although a few are brawny and robust.

It is difficult to discuss the causes of this disease, for the psychology of childhood, especially at the period of puberty, has not been perfectly worked out. I am led to believe that, the practice once started, whether by curiosity following the bad example of a companion, moral perversity following on the first nocturnal emission, habit and lack of knowledge of consequences, are the factors that lead to a continuance of the practice into adult life.

Men in Class I. of my categories never indulge themselves, unless they think of "*les plaisirs d'amour*" in connection with some special person of the opposite sex.

Men in Class II. have little or no thought on the subject, but just prostitute their natural organs with no definite idea and merely for the so-called pleasure of a moment.

In the majority of cases, one recognizes that there is some urethritis present in the part examined, and that few have been circumcised. Smegma collects under the prepuce, and in this are found organisms, streptococci, staphylococci, and I have seen a few attenuated gonococci in a patient who undoubtedly had not acquired gonorrhœa. It can easily be seen how these organisms find their way to the urethral opening and pass down the urethra, causing the mild and unsymptomatic urethritis.

Then the frenulum præputiis is very vascular and highly sensitive. The filaments from there and from the glans penis, through the dorsal nerve of the penis, enter the internal pudic nerve, and are connected through the third sacral nerve to the lumbar centre.

There is no doubt that these three facts—a long prepuce, slight urethritis, and the highly sensitive nature of the part (increased by constant irritation, naturally and unnaturally) have a great bearing on the continuance of the obnoxious practice. A sort of obsession takes hold of the patient, and he feels that his will alone is not strong enough to enable him to break off abusing himself.

There is another accentuating factor which one finds in many cases. That consists in the perusal of literature which is suggestive and sometimes even pornographic. French novels, which merely relate travesties of love and deal with the "sublime passion" in gross and vulgar fashion, are avidly read by these patients, just that their sensitive imaginations may be stimulated by the suggestive descriptions and hardly veiled innuendoes. Thus, one is able to give physiological, psychical, and material reasons for the cause and continuance of this vicious trait, with which some people are afflicted.

Of course, when the patients consult me, they do not always come for advice regarding their real disease. They generally complain of symptoms which arise from the practice, and which may be considered under the head of effects.

These effects vary both in kind and in seriousness. The patient has a typical look in his eyes; he cannot look one long in the face before lowering his eyes; the latter are shifty, and the patient looks as if something were on his mind. Curiously enough, the general health is good and the various bodily organs exercise their functions satisfactorily.

One of the commonest effects, however, is a weakening in eyesight; the eyes, when looking at distant objects, get hazy and moist, and, on testing, are found to be astigmatic. This astigmatism gradually disappears when the practice is finally stopped.

But by far the most important effects are mental. In nearly every case, there is loss of memory, that is, past events are in the course of months forgotten, and only a very dim recollection remains. Forgetfulness is very common. Depression of spirits and morbidity of thought are nearly always caused. At times, the patient has exaltation of mind, only to be followed at no very great interval by feelings of dire depression. The brain becomes less active; sedative pursuits are followed, and a disinclination for bodily action is evidenced.

In this disease, the Freudian ideas of disease, which have their origin in subconscious sexual thought, are, in my opinion, justified. Consciously and subconsciously, there is this canker eating into the core of the purely mental and of the sublimal being, and for a cure to be efficacious and permanent this canker must be thoroughly eradicated.

I have seen and treated a few cases which, as far as one can judge, are now cured. I have employed wholesome advice, supplemented by drugs—for I do not believe that advice alone can effect a cure.

One has to point out that self-abuse has a profound effect on the future welfare of the race; that the production of germ cells is far in excess of the ordinary, and that, eventually when he (the patient) marries, his chances of having children are small; or, if he has progeny, that they will almost assuredly be weak, sickly and deformed.

One must insist on systems of healthy exercise; so many hours a day must be devoted to some kind of *outdoor* sport, whatever he has most inclination for, whether walking, running, cycling, golfing, or swimming.

He must eschew absolutely all kinds of light or suggestive literature. A course of good reading should be prescribed for him; books which are interesting, which call for thought and invite criticism, which are restful to the mind and elevating to the spirit. Every waking hour must be occupied in some healthy pursuit, so that there is no time for him to waste in indulgence in his old foolish and sensual thoughts. Further, he should be encouraged to marry, because with marriage, in any case, the progress of his disease is checked, and he becomes a normal man again.

As for drugs, I have found that potassium bromide, combined with belladonna, is very good at first: gr. xxv. potass. bromid. and 3 minims tr. belladonnæ, taken nightly for a week; then an interval of four days without medicine, and the same drugs again for another week. This administration of medicine with four-day intervals is continued for six weeks. I also order salts, ¾ ounce magnes. sulph. weekly, to be taken in the four days' interval.

As for local treatment, circumcision was always done. The urethra was syringed from the very beginning with increasingly strong solution of potassium permanganate, till all discharge had ceased, and no organisms were found in the urethra.

In this way several cases have been treated, so far with success.

THE PREVENTION OF MEASLES.

By JAMES A. MILNE, M.D., B.S., D.P.H.

Assistant Medical Officer, Dr. Barnardo's Homes and Hospitals ;
Temp. Hon. Assist. Physician, East London Hospital for Children.

MUCH has been said and written, recently, about the need for conserving the young life of the country at the present crisis in the nation's history. Therefore, at a time when measles is so prevalent, the following summary of the method by which an outbreak of measles in a community of 600 children was speedily stamped out should be of particular interest. This outbreak occurred at the Boys' Garden City (one of Dr. Barnardo's Homes). Here, there are sixteen Houses; one of these is our temporary hospital (40 beds), and another is in use as a receiving (quarantine) house, for the boys newly admitted to the home. The 14 other Houses contain an average of just over 40 boys apiece.

The first case of measles (H. R.) was admitted to the home on November 7, 1917, and went to the receiving house. On the 9th, he developed measles, and was transferred to our hospital cottage. The receiving house was at once put into quarantine, and the "Milne"* preventive method begun immediately. Only two more cases (first infection) occurred in the receiving house—on November 19 and 21, and on December 10—they were out of quarantine and the eucalyptus (used in the Milne method) stopped.

Unfortunately, however, one boy (L. J.) was passed out of the receiving house to an ordinary cottage on November 8—one day before the receiving house was put into quarantine, but one day after the first case (H. R.) had arrived. He developed measles on November 22 and infected others in his own and in seven other cottages, resulting in a batch of eleven cases, which appeared from December 1 to 8.

On December 4, seeing that we were likely to have a general outburst, I gave instructions to the cottage "mothers" for the general adoption of the preventive method—introduced by Dr. Robert Milne: that *every* boy in the Boys' Garden City was to have ten drops of pure eucalyptus oil on the day shirt (front of chest) on rising, and again the same on the night shirt on retiring to bed. We had fourteen more cases (first infection, — the cases appearing from December 1 to 8) between December 15 and 22. I did not expect to have any more cases after December 24—the eucalyptus then having been in use for twenty days. I was disappointed, for there were three more cases (each in a different cottage), but in each case it has been proved that the *instructions were not strictly carried out*, some boys having missed receiving their eucalyptus oil on several mornings.

---

* *See* end of this Article and also "*The Prevention of Infectious Diseases (Scarlet Fever and Measles)*," by Robert Milne.

There were 32 cases in all, from 13 different cottages. Measles was rife in the neighbourhood. Two hundred of our boys attend the outside schools; these schools had to be closed earlier than usual on account of measles. During the Christmastide, our boys visited each other's cottages freely at the various Christmas "parties"; and all have meals together (though each cottage has a separate table) in the dining hall. So the opportunity for infection could hardly have been greater. Moreover, out of 563 boys investigated, 367 were "unprotected" by a previous attack of measles. In that connection it may be noted that two (may be three) out of the 32 cases had had measles only the previous year.

The ages of the 563 children are as follows:—13 boys of five years or under. 194 boys of six to ten years. 356 boys of eleven to fifteen years (including a few who are over fifteen years of age).

Of the 32 cases: 5 were five years old or under. 16 were six to ten years old. 11 were eleven to twelve years old.

There was one death—boy, aged five years, of acute broncho-pneumonia. This boy had, it is reported, been desperately ill with chest trouble, prior to admission to these Homes.

The earlier cases were severe—temperature usually 104° F. or higher—but the later cases were milder and modified. All were treated in our hospital cottage by the method introduced by my father. Many were in general wards with other non-measles cases throughout their stay in hospital. Needless to say, there was no infection.

The advantages to be gained by the early and conscientious adoption of this preventive method include the following:—Diminished first infection and none after. Less need for closure of schools and less loss of school grant. The school on our own premises was opened on January 21, when the outside schools were still closed. Greatly diminished loss of life, and health, and less danger from the many after-effects of measles.

Several private families in the district have adopted the method to protect their children, and there has been no attack among these, although some of them have been in contact with, and played with, definite cases of measles.

The need for rigidly and conscientiously carrying out the details is shown by the three failures mentioned above.

Formerly I myself was not fully assured of the value of the method, now, however, I am absolutely convinced.

ADDENDUM.

I add the following in accordance with a suggestion by the Controlling Editor of THE PRACTITIONER, that a brief summary of the method used should be given.

Prevention.—Every "contact" and every child that may become exposed to infection should receive ten drops of the best pure eucalyptus oil twice (or, better still, three times) a day: on the day shirt (front of chest) on rising, and at mid-day, and on the nightshirt when retiring.

Treatment.—Three points should be noted:—

A. Rubbing.—Before being allowed to mix with other children the patient should have his first rubbing. The patient is rubbed all over (scalp included) with the best pure eucalyptus oil, twice a day for the first four days, then once a day for six more days—ten days in all.

B. Swabbing.—The throat is to be gently swabbed with ten per cent. carbolic oil every four hours for three or four days. The swabbing should be carried out, right between the fauces, and may be done by means of a mop of wool on the end of forceps.

C. Gauze Tent.—In measles one of the chief sources of infection is, probably, the cough. A bed cradle, or other substitute, is put over the patient's head, and over the cradle is spread a layer of gauze, just thin enough for the patient to see through. The gauze must cover the head and neck and must be sprayed with eucalyptus oil periodically, every four hours. This is continued until the cough ceases, or for ten days.

OBSERVATIONS ON HÆMATURIA—WITH TWO ILLUSTRATIVE CASES.

By W. H. STIRLING ARMSTRONG, M.B., Ch.B.

Visiting Physician, Renfrew and Clydebank Joint Fever Hospital.

Hæmaturia is a symptom common to so many diseases affecting the urinary system that, in seeking its source and in elucidating its cause, several methods of investigation are required. This is especially the case when its origin seems obscure, and when it occurs, not as part of a familiar clinical picture, *e.g.*, in acute nephritis, but as a solitary and isolated complaint. It is in these latter cases that ordinary clinical examination may either offer nothing but the husks of a diagnosis, consigning us to a blind alley of conjecture, or may cheat us into forming conclusions which, unless supported or corrected by other means of inquiry, are inaccurate and misleading. The following two cases are, I think, of interest as demonstrating that the microscope, the cystoscope, and the X-ray are indispensable to us as aids in arriving at a sound and accurate opinion.

Case i.—A maiden lady, æt. 60 years, wrenched her right side on alighting from a tramcar. A few days later hæmaturia occurred, which was at first amenable to rest, but latterly became more persistent. Although of frail physique, she enjoyed good health. There was no history of renal colic, but I elicited the history of the occurrence of hæmaturia twenty years ago, which disappeared under treatment, and had not recurred. The urine, examined on several occasions, contained albumen and blood. No pus cells or tube casts were observed. Bacteriological examination of a catheter specimen was negative, showing absence of tubercle bacilli, pathogenic micro-organisms, and tumour-cells. The right kidney was palpable, and movable on deep inspiration. It did not appear to be enlarged, and presented a smooth and normal surface. Cystoscopy revealed the presence of a villous papilloma on the posterior wall of the bladder. Parts of this growth showed disintegration and hæmorrhage. The urine, escaping normally from each ureter, was free from abnormal constituents. It was not considered necessary to proceed to X-ray examination.

On finding a movable kidney, associated with a history of injury, it was at first assumed that this was the source of hæmaturia, but, fortunately, it was considered advisable to exclude other possible causes, with the above result.

CASE 2.—A married lady of middle age consulted me on account of hæmaturia of nine weeks' duration, during which time she had been under treatment for cystitis. Although somewhat bloodless, she felt well and suffered from no subjective symptoms. There was no history of renal colic or of injury. Her right kidney was palpable, and movable on deep inspiration. There was no evidence of gross enlargement, and its surface was uniform in character. The urine contained albumen, blood and pus. Tube casts were absent. A catheter specimen contained short chains of streptococci, no tubercle bacilli or tumour cells being present. On cystoscopic examination, the bladder was seen to be normal, but the urine issuing from the right ureter contained blood, that from the left being clear. An X-ray examination of both kidneys excluded the presence of stone and of gross enlargement. Rest, with the administration of urotropine, was prescribed, and the urine soon became normal.

These two cases present many features in common, but how different the "materies morbi," and how easy to be deceived unless a routine practice, including cystoscopic, bacteriological, and X-ray examinations, is pursued! In both it was necessary, by cystoscopy, to confirm or discredit the assumption that the right kidney was culpable, and, by a process of elimination, involving different methods of examination, to reveal the true source and cause. On a faulty diagnosis will rest an unnecessarily harsh or pleasantly untruthful prognosis, with all the dangers of zealous but misdirected treatment.

FALSE AIMS IN MEDICINE.

By O. C. GRUNER, M.D.

Leeds; late Pathologist, Royal Victoria Hospital, and to the Maternity Hospital Montreal, etc.

It is some years since modern medicine, through the agency of a poet's pen, was warned of its neglect of its true mission; but the continuance of medical work on the old lines is accounted for by the difficulty of reconciling material facts with views of what would be ideal. Nevertheless, the same message, given by Edward Carpenter ("Towards Democracy"), may be delivered through the technicalities of medical language, and the processes of life, as seen through the microscope, furnish adequate support to the principles in question. To quote the actual words referred to:

> "*Surely the time will come* when humanity will refuse to be diseased any longer.
>
> "This list of filthy and hideous complaints—too filthy to be calmly spoken of: these small-poxes, typhoids, choleras, cancers, tumours, tubercles, dropsy, diabetes, uræmia—all preventible, and easy enough to prevent.
>
> "And yet—incredible though it seems—men and women still tolerating and condoning them.
>
> "Men and women who pride themselves on their culture, refinement, punctiliousness of nose, and so forth—and who would turn up the latter at the sight of a pig and a few fowls in an Irishman's cabin—actually tolerating in their own persons the perpetual presence of the most disgusting organisms.
>
> "And other men and women, through sheer ignorance, believing such a state of affairs to be necessary . . . a little self-control . . . a clean and elementary diet, pure water, openess of the body to sun and air, a share of honest work, and some degree of mental peace and largesse, are the perfectly simple conditions of health. . ."

The same cry proceeds far and wide from the "health" papers, from the food-reform votaries, from the advocates of vegetarianism and fruitarianism, and various organizations tending towards the same goal. But the practitioners who take these manifestations of the new age seriously are few, chiefly because they cannot travel the whole distance with enthusiasts who do not stay to tidy up the intermediate portions of their roadway. This is a difficulty which can be removed by a careful reflection upon the general nature of morbid processes.

The aims of medicine are not clearly discernible, but the literature of the day bears testimony to the eager pursuit of knowledge along every road but the one which will guarantee success. Six years ago there were learned men who deplored the ever-increasing output of scientific literature, and even talked of having a central bureau for the classification and assessment of articles published in the various countries. Nevertheless, the call for economy in paper has not availed much in lessening the number of detached case-reports and testimonials to the efficacy of various remedial measures. We are clearly faced by the fear lest a few years' silence will leave us behind, if we ignore literature entirely, or by the disconcerting position brought about by too inquiring patients who demand why a given "new treatment" has not been tried in their case. But there are few who will really deny that modern research does not give any substantial progress towards the *abolition* of disease. Hence, we arrive at the conclusion that the false aims of medicine are numerous and receive authoritative attention, whereas the sole true aim is never really considered at all. It has to be admitted that the true aim cannot be achieved by medicine at all, but must come from the State, almost certainly through a Ministry of Health; nevertheless, academic medicine should be in a position to discard all trivialities for the sake of the grand issue.

But the first step to cure this pursuit of false aims is proper education as to the real nature of disease. As long as we are taught that pathology is an intricate subject, which can only be understood after a long course of tuition and the study of dead specimens, and as long as we believe the teaching that disease is a complicated process, and every disease fundamentally different from every other, there can hardly be any other conclusion but that hospitals, sanatoria, and other institutions are eternally necessary to human existence.

Fortunately, the practitioner meets with so many instances, in which the doctrines of academic medicine are *not* borne out by experience, that he is able to keep himself free from too close a worship of his text-books. If it is really true that undoubted cases of cancer have sometimes recovered spontaneously, if it is beyond question that certain persons *have* been cured of chronic and academically fatal diseases (through the agency of herbalists and such like), the proper thing is to inquire afresh into our pathology and be prepared to make fresh foundations for our science, however proudly it has hitherto stood on the existing ones.

It is useful to ask oneself, are hospitals to exist for ever? Is disease never to be eradicated? It is also useful to inquire whether it is true that the armies in the field are really healthier than congregated human beings ever were before. What proportion of the benefit is to be ascribed to the vaccine treatment, and what to the sanitary corps? Is the use of chlorinated water a fad, or is it by any chance the *real* reason for the immunity from typhoid?

Such questions will go to show that the practice of medicine must surely be hygienic; that the progress of the race towards health must be secured through a Ministry of Health, which is granted autocratic powers on condition that these shall be used with fairness; that the study of isolated cases is waste of time compared with the infinitely greater issues of sanitation in the city, in the streets, in the home, in the personal life.

The objection is easily made that people are ill and need attention. And the answer to this brings us back to the starting-point, that we must know what disease really is. We must express it in such simple terms, almost algebraical, in order to be able to put our finger exactly on the spot which has to be worked at in order to arrest its development. We can arrest the development of an aggregate of cases as easily as we can arrest a single clinical case; that which applies to one applies to the other. If the continued use of medicated baking-powder causes 150 cases of obscure disorder, its detection for one should cause the stoppage of all the 150.

The whole of modern teaching is that disease comes from without. Every contribution to the literature has as its key-note "microbic infection," and as consistently ignores the possibility that errors of metabolism may be primary. As a matter of fact, no doubt, the secret of disease lies in a combination of the two circumstances, but owing to the neglect of the second it is not incorrect to state the following as the current ideas upon the nature of disease:

(1) The lay person looks upon his illness as really quite a bolt from the blue, bound to hit him some time sooner or later unless he is very fortunate. When taken ill, he usually applies to a doctor, believing that he must get to know the *name* of his complaint, for otherwise the proper remedy is not available. If the remedies fail, there must have been a mistake in diagnosis. Even the value of a consultant is gauged in terms of his ability to put a correct label on the case.

(2) The student comes to medicine with much the same idea. Has he not been brought up to believe that disease is the evidence that the person has succumbed to the constant warfare of our bodies against the invisible occupants of the germ-laden atmosphere? We are made to believe that our health depends on the successful attack of our leucocytes (*which do not weigh more than two ounces all told*) against myriads of germs. Concessions are made to the influence of climate, inheritance, diet, etc., but we are taught that on the whole there can be no possible *guarantee* of escape. When the acute illness comes, the student examines it by a routine; he may be farseeing enough to know that his examination is really for the purpose of labelling the case as an anatomical specimen of this or that kind, the counterpart of which resides on a museum shelf. He may be introduced to the idea of looking at the patient's *functions* by looking for albuminuria, for instance; but even so, he only looks at it as a sign of disorder of the structure of the kidney. If he should find albumen without casts, he is floored. He is so concentrated upon anatomical disturbances that he forgets that they are *all* nothing short of the *end*-phases of diseased processes. Not until he gets into private practice does he realize that his help is much more often required long before there can be any question of an anatomical lesion at all.

(3) The student's view is, naturally, a reflection of that

of the physician, his teacher. The physician's view is kept up by the creeds of the journals, and by the idea that no one can possibly make a correct scientific observation without spending years in a laboratory. Some day, no doubt, everybody will see that observers were just as keen and just as good a few decades ago, before there existed such a thing as a laboratory at all.

(4) The bacteriologist also has his views of the nature of disease, and the dominance of the study of those aggregations of matter which are named "microbes" makes him see in every illness some form of bacterial or microbic infection. Harvey's dictum "*omne vivum ex* vivo" has been studiously read as "*omne vivum ex* ovo," which are two very different concepts. Hence we have arrived at the age of blood-cultures and of standard agglutinations, which are to be accepted regardless of daily discrepancies.

(5) There is another view of disease: that taken by the nurse. She realizes there is "something wrong" with her patient. However much she is educated in the knowledge of the day, she is forced to confine herself to the study of the patient's *condition*, how to alleviate his pains and aches, how to secure his sleep, how to give him nourishment. She has to watch lest the serious illness demands the kindly human sympathy of the nearest relatives. One might almost say that, were it not for the mystery which has been thrown over pathology by those who love to have it so, the nurse could lose her fears of making mistakes, and emerge strong enough in plain common knowledge to be able to tear aside the veil—and find the statue of pathology is no more than a phantom of theory and one-sided observations.

How shall the truth be expressed? The more one studies the tissues under the microscope, the more convinced does one become that all this science—considered so difficult and unapproachable—can, after all, be reduced to a very simple formula, which repeats and repeats for every organ. Academic science calls the same things different names,—that is all. How few have grasped the idea which underlies the appalling fact that there are *eighty-seven* different names given to one single blood-cell?

The real thing is *so* simple. Every part of the body is made of cells, some of which are still, and others move about.

Of those who are still to-day, some may be moving about to-morrow. We can schematize, as in Fig. 1. A central vessel, a lymph-space round it and a spongework of reticular tissue between the latter and the specific cells of the organ (liver, muscle, heart, kidney, etc.). The framework is a stage, and the cells are actors. And every fragment of the body is still a stage; but the various parts are bound together with a continuous linkage of nerve-fibrils. The scenery looks different in different places, and the actors are, as it were, speaking different languages; but the drama is, after all, the same. And all that disease is, is that in some places the audience do not like the piece, or something makes the actors sleepy, and so they perform their parts but ill. And if one theatre of action goes indifferently, others may follow suit. And if many follow suit, the *ego* becomes aware of it, and, perchance, may go to bed. He may, indeed, never leave his bed. But, still—that is all.

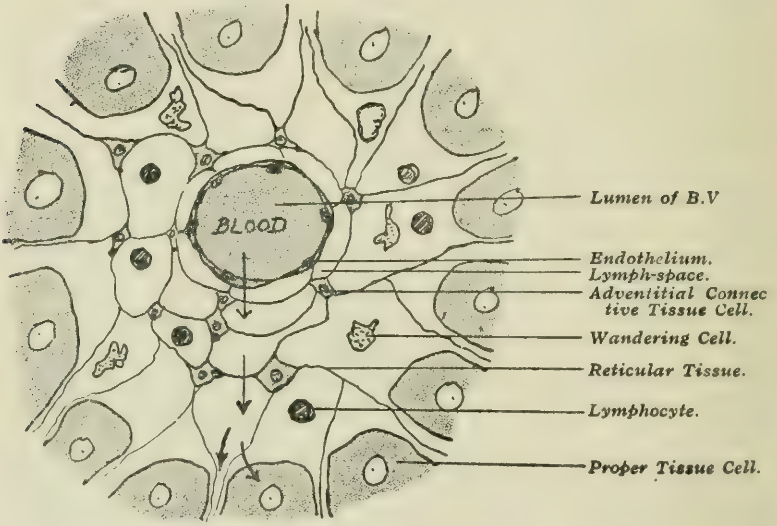


FIG. 1.

To make this more concrete would need a detailed account of such a process as appendicitis or nephritis; and to make the reality quite certain, it would be necessary to take up every morbid process and actually show that it fits into the same frame. The poisoned blood which "drugs" some endothelial cells; the microbes which may settle there, and grow, and pour out their excreta into the adjoining colloidal substrate, the diffusion of this material into lymph-space or into reticular tissue, the bathing of the connective tissue cells in objectionable material, their getting up and walking away, their conversion into other cells, the wandering-in of other cells from adjoining areas, the swelling-up with watery material attracted thither in order to dilute the objectionable matter and finally wash it away, the conversion of the field of action into what is called "round-celled infiltration" (a medley operatic chorus, which makes its presence felt), the pollution of the lymph flowing past towards the kidney-cells, for instance, and their consequent decay, the gradual accumulation of noxious substances until some other organs begin to show the taint, and so forth . . . so great a sequence of events occurs, and be it pancreatitis, or hepatitis, or myositis, or endocarditis—the process is the same, although the chemical substances and groupings are diverse. Yet the means which will ultimately restore them all to normal are very very similar and very very simple; free action of bowels or skin, pure air, very simple food, and rest in bed,—and patience.

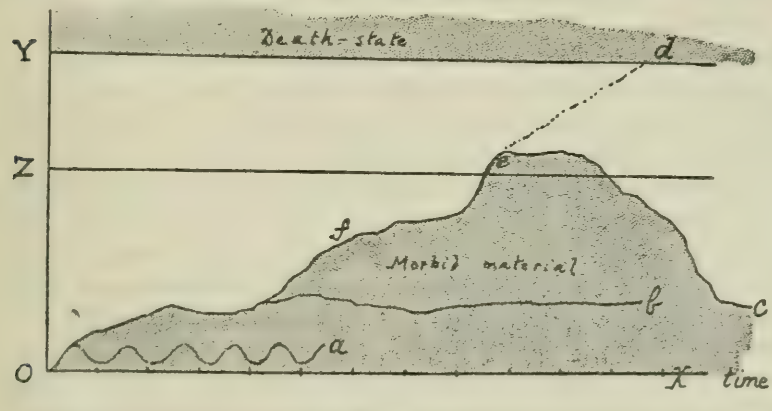


FIG. 2.

It is possible to represent it all in another form (Fig. 2). Let a horizontal line (OX) represent the progress of time, each mark depicting successive minutes, hours, days, or weeks—according to the case. Let the vertical line (OY) mark off degrees of richness of "disease-stuff," and let a second horizontal line (Z) arbitrarily represent a state of maximum health. It is convenient to use some popular terms in the description. The second line may be paralleled to a "sea-level," the irregular curve which ascends from zero and may or may not (*b*) touch the "sea-level" corresponds to the "ocean-bed." If this bed comes to the surface (*e*), we have an "island" or a "promontory," "the edge of the sea-shore." A person standing above the sea-level may therefore see an "island" or "land"; or he may not. When he is looking down on the sea-level, it is analogous to one person looking at another. If there is no "island," the person seen is in apparent health. But if the person seen has a high "ocean-bed" (*f*), he may feel ill without the observer knowing it.

In order to *assess* the person's health, then, the observer must find out the level of the ocean-bed. And he must try and ascertain if that bed is rising or falling.

Disease, on this plan, is therefore a condition in which the amount of "disease-stuff" in a given organ (or in the body as a whole), is present to so great an extent as to produce a manifest blockage of normal functions. The chart, indeed, holds good for every disease, although the nature of the "disease-stuff" differs in each case, and its clinical manifestations differ accordingly. Pneumonia differs from nephritis only in the character of the material to be represented on the "ocean-bed"-line, and the abscissæ would be days in the former but months in the latter. In the former, the disease-stuff is being poured out by the lung, in the latter by the kidney. If some is poured out by the kidney as well as the lung, we call it a complication of "albuminuria." From this point of view it is really only an accident that either disease can be called an "entity."

This method of presentation enables one to see clearly that a person may be ill for a long time without showing it, and that if his "ocean-bed" is up to a certain point, he may develop (say) pneumonia, or nephritis, or some other "disease," indifferently. Similarly, when he has got well, to outward observation, he is still ill until the ocean-bed-line is well below the danger-zone. Should the chart represent a case of cancer, we can see clearly that the "island" represents the period during which the *tumour* is visible. The surgeon may excise, but the *disease* is still there. The existence of the disease after surgical operation can easily be demonstrated by a careful study of the blood. Such a fact cannot be understood in any other way.

Finally, if the disease-stuff cannot be discharged by one or other route, it will accumulate. The "land" will increase in height, and the "mountain" will ultimately reach into the sky-line (*d*). This graphically represents the process of dying, and of death. At death the whole body is converted into "disease-stuff." And here, again, the fatal issue occurs rapidly when we mark off the abscissa as days, slowly ("a chronic invalid") if the divisions mark weeks, or months, or years.

Naturally, every objection to this pathology-in-a-nutshell can be dealt with only by taking every case *scriatim*, and the student of pathology will be able to go over his text-book and see everything fit in to one scheme, whereas, without the scheme, the whole aggregation of facts is really meaningless. Armed with this conception of disease, the practitioner knows exactly what he has to look for in a patient; it is not the physical signs of pneumonia, as much as the existence of morbific matter, its nature, and the best means of accelerating its removal. Once know what will make the morbific matter fall, and recovery can be inevitable.

It is equally important that this "disease-stuff" is *normally* in our bodies, and that, roughly speaking, the difference between health and disease is merely the height of this curve, the content of disease-stuff, and its persistence. Every day the line rises, and every night it *should* fall. Every morning, on rising from bed, the ocean-bed-line should be at zero (curve *a* in Fig. 2). But constipation, lack of open air, lack of exercise, lack of uncooked fruit, improper clothing—will all prevent its return to zero.

In such a case, it accumulates little by little, and some people call it fibrous tissue, others arteriosclerosis, and others call it round-celled-infiltration; but no one seems to see that it is just inert and non-metabolizing colloidal substance rich in calcium, forming a coating over all the cell-processes in the reticular material between the blood-vessel and the tissue cells. This is analogous to the "fur" which is deposited in kettles where the water-supply is hard. Those who are cautious, and can afford it, will use distilled water in such a case rather than drink limey water and spoil their kettles. So, too, the time must come when the public sees that a very similar thing happens through not using proper food, and that there is far more importance in these simple measures of ordinary hygiene than in all the doctrines of microbic infection. It is the usual catastrophe, the casual incident magnified into an Armageddon, with the result that a curable state of affairs is never touched at all.

It is only after shaking free from the restless search for the unknowable, after getting back to child-like simplicity of conceptions, after seeing that the remedy for illness must lie in non-acceptance of artificial foods and modes of life, that physicians and patients alike will be able to walk in the land of beauty which the health age is offering us. To find that the simple commonsense rules of life, adopted everywhere, would make all illness vanish as the morning mists, should surely make all see what is the true aim of medicine: to teach people how to live, and not to seek vaccines and sera. We know that slum-houses cannot breed sound men; we know that night-shifts cannot breed healthy red cells; we know that furnaces and factories are not the heritage intended for man; we know that the "simple life" *is* the ideal, and we know that people *must* get back to the land, and be content with simple enjoyments. We know that it is necessary to give the Ministry power to renovate our cities; instead of hospitals, to build gardens; instead of pensions, to help the gaumless women to clean their children and their homes and send kindly people to talk to them (not patronize them) and make them friends. Meanwhile, may the practitioner remember that at bottom, neither pathologist nor consultant knows as much as he; and let him read pathology as it is, and not as others say it is.

AN HISTORICAL CASE OF RICKETS;

BEING AN ACCOUNT OF THE MEDICAL EXAMINATION OF THE REMAINS OF PRINCESS ELIZABETH, DAUGHTER OF KING CHARLES I., WHO DIED AT CARISBROOK CASTLE, SEPTEMBER 8, 1650.

By CHARLES BURLAND, M.D.

Senior Medical Inspector, Board of Trade.

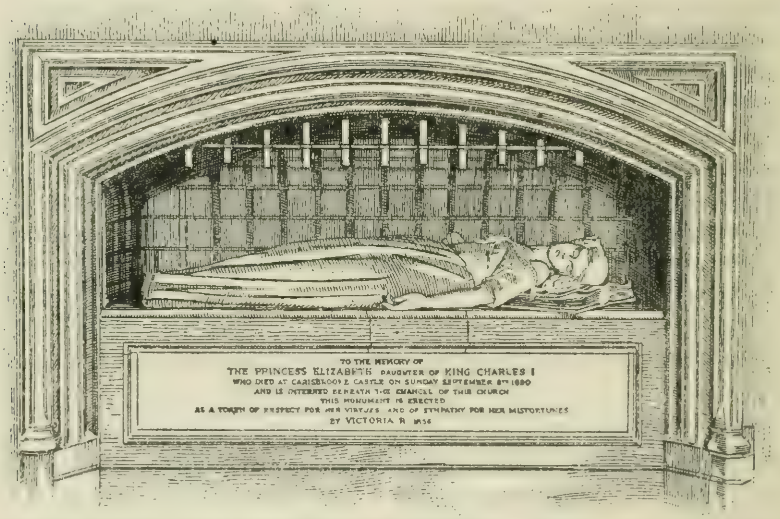
It is now nearly 62 years since this interesting communication from the pen of the late Ernest P. Wilkins, Esq., a gentleman distinguished for his professional skill and antiquarian research, was published in a local magazine. But the members of the town council of that day became alarmed, for reasons not necessary to mention here, and through their influence the number containing the article was suppressed. As the stained glass windows of the monument in St. Thomas's Church have, however, now become accomplished facts, there is no reason why such an important document should not become generally known. Many of those who were the cause of the suppression are now "gathered to their fathers."

ACCOUNT OF THE REMAINS OF THE PRINCESS ELIZABETH, BY THE LATE E. P. WILKINS, ESQ., M.R.C.S.

In 1856, an opportunity was afforded me of making a professional examination of the remains of Princess Elizabeth, who died in 1650. Her coffin was discovered during the demolition of the old church of St. Thomas in a small arched vault within the chancel. It rested on two rudely arched stones. At the eastern extremity of the vault was a recess, in which, it is recorded, a vessel stood containing her heart. This, however, if it ever existed, had been removed. Her coffin was roughly constructed of lead, it had a ridge running its entire length, from which the lid sloped in a curve to the edge. It measured 5 feet 3½ inches in length, tapering very much towards the feet. The inscription, rudely cut in three strips of lead which were laid over and slightly fixed on the lid, was as follows :—

ELIZABETH, 2ND DAUGHTER
OF YE LATE KING CHARLES,
DECED. SEPT. 8TH, M.D.C.L.

On the lid being raised, a skeleton was disclosed to view, with a mass of tenacious clay-like substance of a pale brownish red colour retaining somewhat the shape of the abdominal and thoracic cavities—no doubt it consisted of the usual substance then used in the process of embalming, merely changed in character by duration of time. The whole was moist, while the floor of the coffin was covered to the depth of a few inches by a similar material in a semi-liquid state. The inner coffin had almost disappeared except beneath the level of this semi-liquid matter, which appeared to have acted as a means of arresting its decay.


TO THE MEMORY OF
THE PRINCESS ELIZABETH DAUGHTER OF KING CHARLES I
WHO DIED AT CARISBROOKE CASTLE ON SUNDAY SEPTEMBER 8TH 1650
AND IS INTERRED BENEATH THE CHANCEL OF THIS CHURCH
THIS MONUMENT IS ERECTED
AS A TOKEN OF RESPECT FOR HER VIRTUES AND OF SYMPATHY FOR HER MISFORTUNES
BY VICTORIA R 1856

The hair was still preserved around the skull—its colour was brown, approaching to auburn, and it appeared to have been of considerable length. The bones were much decayed, but sufficiently sound to discover their diseased condition. Their epiphyses were nearly all detached—indicative of her youthful decease. I minutely examined the abnormal shapes, more particularly of the long bones, and made notes about them, of which the following is a summary :—

The back part of the skull was much larger than the fore part, giving to the forehead and the face a highly narrow and contracted appearance, with a lowness of the forehead and prominence of the chin.

The part most prominent was that named by phrenologists the region of cautiousness—this organ over-developed is said to indicate despondency and despair. The tables of the skull were very thin, the teeth on the left side of the upper jaw were irregularly developed, the others being normal—the wisdom appear not to have been cut, although those of the upper jaw were fast approaching to view.

The bones of the upper arm were slightly curved outwards —more particularly the right humerus—while those of the forearm were somewhat twisted and considerably curved outwards. The spinal column, retaining the relative position of the vertebræ during life, presented an extremely curved condition constituting the double lateral or S curvature of pathologists, which must have caused considerable projection of the right shoulder-blade and its attendant deformity.

The ribs on the right side were broad, and overlapped each other.

The condyles of the lower extremities were very large in relative proportion. The femur or thigh bone of the left side was curved forwards and inwards, that of the right side was more distorted than any other long bone. It was very much curved forwards and inwards. This bone was much flattened, its greatest diameter being from before, obliquely outwards and backwards; the concavity of the curve was somewhat filled in, and the bone thus strengthened by additional osseous deposit in accordance with the natural reparative tendency of Nature's laws. The bones of the leg, the tibia and fibula, were much curved outwards.

The bones of the skeleton indicate the great deformity which existed during life—there was evidently considerable " growing out " of the right shoulder-blade and corresponding flattening of the left side of the back. The lower extremities were contorted and of unequal length, the knees were what is termed " knocked " ; below the knees the legs were bowed, the heels thrown outwards and the toes inverted. This, with the description of the skull alone, will sufficiently convey an idea of her personal appearance when living.

It is clear she suffered from rickets in an advanced degree.

The first account of the disease called rickets was drawn up by Gilison and two other English physicians in 1650, who considered it first appeared in England in 1620. I should consider it more probable that it existed previously but it had not been recognized. It is a remarkable coincidence that in the very year she died, the first description of a disease with which she had been afflicted was promulgated to the world.

There is evidence enough that any treatment she may have received was on doubtful knowledge of her complaint. That the art of astrology was used in her case in combination with medicine, we have substantial record, for Dr. Trelierne sent a physician and "remedies of election," having previously cast her horoscope. Yet, even if there was a deficiency of medical knowledge at that period, it is no proof that she did not receive every care that art and kindness could bestow; on the contrary, she seems to have had the advice and assistance of both local and metropolitan skill, and to have been entrusted to the guardianship of a humane and faithful gentleman.

This recent recognition of rickets may fairly account for the erroneous causes to which her death has hitherto been ascribed by historians, although the immediate cause of the termination of her life may have arisen from "a cold taken while playing at bowls," which probably in her diseased condition may have lighted the spark which consumed her existence.

She is said by authors to have been of a sickly constitution, and possessed of a judgement beyond her years, while her portraits exhibit an air of sadness and precociousness. All this is quite compatible with her disease; indeed, it is part indicative of its existence, and would have existed independently of her melancholy position, for disease had its development prior to the sway of the passions of her mind.

Hence, too much must not be attributed to her "sorrows & fearful anticipations," although such would undoubtedly have had a highly pernicious effect on a growing girl of sensitive feeling and more particularly on one in her diseased state.

Pathologists agree in considering rickets as a disease peculiar to infancy, mainly attributable to bad nursing, etc., and although subjects of it may attain to puberty, they never live to any great age where it exists in an aggravated form; that such was the case with Princess Elizabeth, the foregoing anatomical description of her remains has sufficiently shown.

During the incubation of rickets, the bones are soft and pliable, and in a short time become curved under the weight of the body or even under the natural action of the muscles. The latter will account for the distortion of the bones of the princess's arms, which, indeed, would only have occurred in an advanced stage of the disease, because the deformity proceeds from the lower extremities upwards, involving in succession other portions of the skeleton until the whole is involved in the complaint.

It may have been noticed that the bones of the right side were most distorted—we may presume that the natural superior muscular development of this side of the body may in some degree explain this want of corresponding deformity.

During the progress towards a more healthy condition of the system, the diseased formation of the bones is not arrested, but a deposition of healthy osseous matter is most actively carried in those portions of bone where it is most wanted, *i.e.*, in the inner or concave surface of the curve of the long bones. As I have before mentioned, this reparative process has been effected to a considerable degree.

The gait of the subject of so much malformation must have been awkward and irregular and by no means graceful.

Practical Notes.

TREATMENT OF ACUTE INTESTINAL DISORDERS.

Cohnheim recommends, in the early stage of acute diarrhœa and cholera nostras, that, instead of the usual dose of castor oil or calomel, from ¾ to 1 litre of normal saline solution shall be given and drunk off immediately. In the course of about half an hour to an hour and a half, after drinking this down, several loose stools in quick succession will result. The effect is much more quickly produced than after a dose of castor oil or calomel. For further treatment he prefers to use morphia and codeia in place of opium, giving an equal dose of each alkaloid. These possess to a high degree the power of inhibiting movements of the bowel, so that only a small dose of each is required in place of the larger one of opium or pantopon usually given. With them he combines bismuth, and the treatment is continued until the stools show that the upper part of the alimentary canal has recovered its function, when a diet containing plenty of meat and butter can be given.—(*Corresp. bl. für Schw. Aertze.*, February 9, 1918, from *München. med. Woch.*)

THE PROPHYLAXIS OF MEASLES.

An outbreak of measles in the *Hôpital des Enfants-Malades* gave Professor Marfan the opportunity to put various methods of prophylaxis to the test, and in a recent lecture he discusses the subject in the light of his inquiries. He insists, above all, upon the necessity for prompt isolation in all the acute infectious diseases of childhood — measles, scarlatina, varicella, diphtheria, whooping cough, mumps, and cerebrospinal fever. A trial was made of Milne's method, which is supposed to obviate the need for isolation, but Marfan states that he does not think it should in any way replace isolation. This, he recommends, should be strictly enforced with all the precautions usually carried out. In hospital practice, every case ought to be isolated separately and not put in a ward with other cases suffering, or supposed to be suffering, from the same complaint. He considers collective isolation of patients, presumably suffering from the same disease, to be very often worse than no isolation at all. He is an advocate, accordingly, for the cubicle plan in place of the large ward. In old buildings, the use of movable glass screens is suggested, as well as all measures for avoiding dust rising from the floors.

He insists upon four conditions for this essential part of prophylaxis in the infectious diseases of childhood. (1) It must be adopted at the earliest possible stage, because all these diseases are at their most infectious stage when developing. (2) All doubtful and suspicious cases and, sometimes carriers, must be isolated. (3) The period of isolation should be of a duration appropriate to each disease. (4) With the isolation certain additional measures should be adopted to prevent the carriage of infection by persons and objects.

The patient is kept thoroughly clean, and the mouth and nose sprayed daily with 1 in 50 eucalyptus oil. In scarlatina, the skin is rubbed daily with 2 per cent. eucalyptus ointment. Before discharge from isolation, the patient is rubbed thoroughly all over with alcohol after a good bath. The room occupied by the patient and every article in it that is used by him is well sprayed with 1 per cent. of solution of formaldehyde, and left closed up for 24 hours. Marfan insists, too, upon the most scrupulous attention to every personal detail on the part of all in attendance upon the patient.—(*Journ. des Praticiens*, January 12, 1918.)

VINCENT'S ANGINA.

Deglos has reported his experiences with this disease in the military hospital at Grenoble. Out of 255 cases of sore throats of doubtful nature sent in for observation, in 21 the Vincent organisms were found to be present. The cases were mostly those of young soldiers with dirty mouths. The disease was most frequent in the spring, disappeared in summer, and reappeared in the autumn. The early symptoms were slight in character; a little malaise, fatigue, some dysphagia, and, most noticeable of all, one or more tender glands in the neck. There was exudation, yellowish white, sometimes grey in colour, spreading over the tonsil. It was easily detached, leaving an unhealthy-looking ulcer, and setting up a little bleeding. There was a very foul smell with it, and a great deal of salivation. There was a slight rise of temperature, and the pulse was a little quickened. The tendency of the disease is to recover, but some cases may be very obstinate and lapse into a chronic stage. The diagnosis must be confirmed by bacteriological examination, revealing the presence of fusiform bacilli and long spirillæ.

The cases were treated by swabbing with a 10 per cent. solution of methylene blue, twice daily, after thoroughly cleaning away the exudation, and applying a solution of nitrate of silver to the ulcer. Deglos tried as well the application of neosalvarsan in powder or suspended in glycerine. In some cases he was able to report quick results from the intravenous injection of this substance, using Revaut's method of a concentrated solution. One injection of 0·30 g. in from 2 to 3 cc. of distilled water was followed by complete healing up in five or six days. A similar dose at the end of four days ensured complete recovery, clinically and microscopically, in eight or nine days.—(*Journ. de Méd. et de Chir. prat.*, February 25, 1918.)

Reviews of Books.

Otosclerosis. By Albert A. Gray, M.D., etc. Pp. xii + 199. London: H. K. Lewis & Co., Ltd. 12s. 6d. net.

The appearance of a book upon Otosclerosis, by the author of that magnificent work the *Labyrinth of Animals*, marks a new epoch in the study of the condition with which it deals. This condition is one which has long occupied and puzzled otologists. The chapters into which Dr. Gray has divided his work deal with age and sex heredity, biological aspects, pathology, general considerations on the pathological changes, and notes on treatment and prognosis. The great feature of the book is that it represents the clinical, pathological, and therapeutic observations of its author, and is no compilation of other people's work. One of its interesting parts is the chapter on heredity, in which occur fourteen family trees. It is a pity, however, that no attempt seems to have been made to work out these trees upon Mendelian lines. But the most important feature of the book is found in the chapters upon the biological aspects and pathological anatomy. These are written by the master-hand of one who, by patient and unremitting toil has garnered to himself a rich harvest of well-observed facts. Space does not permit any entry into detail here; it must be sufficient to note the opinion that Gray holds that otosclerosis is a variation, using the term in its biological sense. Hence the condition may arise apparently spontaneously and yet be transmitted.

The work is well illustrated by 20 photographs from the author's specimens. These photographs and photomicrographs were taken by himself, and have in no way been "touched up."

Dr. Gray is to be congratulated upon producing a work which bears the stamp of one whose lines of thought run upon strictly scientific, *i.e.*, commonsense, lines. It shows that British science can be trusted to reign supreme even in war time.

Practical Guide to Diseases of the Throat, Nose, and Ear. By Wm. Lamb, M.B., C.M., M.R.C.P. Pp. xii + 372, with 61 figures in the text. London: Baillière, Tindall and Cox. 8s. 6d. net.

We welcome the fourth edition of this excellent little manual, which has been carefully revised and brought up to date. The value of the work we indicated in our former notices. Four figures are new and about 18 pages of new matter have been added. In his preface to the new edition, the author emphasizes the usual ignorance of the general practitioner in matters otological, and we are fully in agreement with him in the attitude he takes up.

We wish Dr. Lamb a speedy fifth edition, and would suggest to him that he should therein give due prominence to the grave importance of the *prevention* of deafness.

Gonorrhœa and its Complications. By Dr. Georges Luys. Translated and edited by A. Foerster. Pp. xxi + 386. London: Baillière, Tindall and Cox. 21s. net.

We had the pleasure of reviewing the first edition of this book, which is, without doubt, the best book on gonorrhœa alone in any language. The translation from the French is also much above the average of the usual translations we have to deal with. The book is certainly more adapted for those conversant with the subject, because a reader who is trying to learn about gonorrhœa will be unable to draw the right proportion between what is rare and what is common. Considering how comprehensive the work is, it seems to us a pity that the *rationale* of vaccines and their use in treatment is not more fully dealt with. Although we admit that the complement fixation test has its limitations, nevertheless, considering how much work upon it has been done, a detailed account should appear in the next edition, because a book of this type should be regarded as one of reference. We think too much stress is laid upon instrumentation, especially with the urethroscope, which, after all, as a means of treatment, is extremely limited. Gonorrhœa of to-day is being over-treated, and this is largely due to the fact that authors dwell too much in their writings upon the use of instruments. Broadly speaking, gonorrhœa differs little from inflammation of any other tracts or even of wounds, and most of us have learnt that cures are most easily to be obtained if chief attention is paid to rest and cleanliness. The fault of present day medicine lies in the belief that disease is to be overcome by attacking the parasite directly, a condition which is unobtainable, because a drug sufficiently powerful to kill organisms will injure the cells of the host. When the general opinion prevails that the cure of disease is natural and only to be accelerated by increasing the patient's natural resistance against it, then, and then only, shall we see gonorrhœa and its treatment in the proper light. That will also be the time when much in the books of the present day will become history, while the important part will be condensed in a few pages. We dwell somewhat lengthily upon this, because text-books, of the kind we are now reviewing, are apt to give a wrong impression of the disease to those who are conversant with it. Having seen, tried, and, for the most part, discarded nearly all the methods of treatment in Dr. Georges Luys's book, we can only say that for those who require first-hand knowledge of any of them, no better book exists. For those whose knowledge of the subject is limited, we should advise gaining some practical experience before reading the book through carefully, because for one thing our statistics of the percentage of complications is distinctly at variance with that of the author's. If the author believes that 25 per cent. of all cases develop epididymitis, we can only say, that that concurs with our previous remark, namely, that present-day gonorrhœa is suffering from over-treatment.

Preparations, Inventions, Etc.

"HYPOLOID" SCOPOLAMINE HYDROBROMIDE.

(London: Messrs. Burroughs, Wellcome & Co., Snow Hill
Buildings, E.C.1.)

Under this name are presented two strengths of pure scopolamine hydrobromide in 0·5 cc. sterile solution, ready for hypodermic injection. The strengths are gr. $\frac{1}{150}$ and gr. $\frac{1}{450}$, which are those generally used for the production of scopolamine-morphine narcosis in childbirth, the stronger being for the initial injection, and the weaker for those made subsequently. The preparations offer obvious conveniences, for the precise dose in sterile solution is contained in an hermetically sealed phial, and when required for use is drawn up into the syringe, with a minimum of trouble.

These hypoloids are supplied in boxes containing ten phials each of the different strengths.

ROBOLEINE.

(London: Messrs. Oppenheimer, Son, and Company, Ltd.,
179, Queen Victoria Street, E.C.4.

This preparation is an emulsion of red bone-marrow, obtained from the long bones of oxen, in extract of malt from Scotch barley, and the expressed juice of fresh rib-bones from calves, which has a special action on the production of red blood-corpuscles, and contains lecithin and cholesterin. A small quantity of a specially prepared extract of yeast is added, the vitamines contained in which have been found greatly to promote carbohydrate metabolism. Hypophosphites of lime, potash, and soda are incorporated as well, so that the preparation presents all the elements necessary for repair of and for building up wasted tissue.

It is very palatable and fragrant, and has the appearance and consistency of dark honey. It is taken very easily, especially by children, either plain, spread upon bread and butter or toast, or mixed with porridge, milk puddings and the like. It is being used largely to replace preparations of cod-liver oil, when these cause nausea or are refused altogether. It is reported on most favourably by many sanatoria throughout the country.

The indications for its use are obvious in the treatment of wasting diseases of all kinds, anæmia, general depression, both bodily and mental, and in slow convalescence due to weakened digestive functions.

It is issued in wide-mouthed bottles containing ¾ lb. and 1½ lbs. and in bulk to hospitals, sanatoria and for National Health Insurance prescriptions.

THE PRACTITIONER.

MAY, 1918.

EDITORIAL.

It will be noticed that the number of our pages has been reduced this month. Subscribers will, of course, realize that we are helpless in the matter, for the Government has issued fresh restrictions and regulations which render it imperative that less paper shall be used. All journals are affected.

We have gone to a great deal of trouble and expense in endeavouring to meet the requirements of the Government, and, at the same time, to continue to give our readers the same value as before. We have, therefore, decided to abandon the large type which has hitherto been a characteristic feature of The Practitioner, and to use the smaller with which this number is printed. We appreciate that it is perhaps not quite so convenient and easy reading as the former type, but it enables us to make the reduction in the reading matter almost a negligible quantity. Although, therefore, the Journal looks smaller, yet it contains nearly the usual amount of literary material.

It must not be thought that the reduction in the size of the Journal means increased profit to ourselves. Paper, to take but one example, has advanced nearly eight times its value since the beginning of the war, so the reader will readily perceive what this means when it is stated that we have been accustomed to purchase twenty tons at a time. Expenses in every other direction have so enormously increased that it actually costs more to produce a journal of the size of the current issue than it did the full pre-war size. Whilst on the subject of increases, it may not generally be realized that no less a sum than fifty-five thousand pounds has been paid to our subscribers under our insurance benefits, and this sum is absolutely and entirely distinct from the amounts paid by the insurance company. The death portion of the benefits, which has not been found to be of much use, is being discontinued after present contracts expire, but a great many members are increasing their benefits by means of the special war-time policies guaranteeing ten guineas a week.

We take this opportunity of thanking the Profession for the very gratifying support which continues to be accorded us. Our circulation has not gone back, but instead has considerably advanced, and to-day stands greater than it did before the war.

Contributions for publication from our readers are always welcome, but writers must remember that their articles should nowadays be as short, concise, and practical as possible.

We reach our half century during next month with a finer record for usefulness than any other Medical Journal or medical institution—a record of which we are naturally very proud.

THE "INFLUENCE OF DOSE," AND ITS BEARING ON THE QUESTION OF THE COMMUNICABILITY OF TUBERCULOSIS.

By LOUIS COBBETT, M.D., F.R.C.S.

Lecturer on Pathology, University of Cambridge, etc.

Two facts stand out prominently among recent discoveries relating to the ætiology of tuberculosis, namely:—

1. The extreme frequency of infection.
2. The dominant influence of numbers of bacilli in determining the severity of an infection, as shown by experiments on animals which, like the ox, have considerable powers of resistance.

I purpose in the following pages to examine the bearing of these two facts on the question of the communicability of the disease, and to consider how the conclusions arrived at affect the problem of its prevention; for it will be obvious that the principles, upon which a sound system of prevention may be based, can only be arrived at when we shall have learnt how the disease is propagated.

THE EXTREME FREQUENCY OF INFECTION.

It has been known for a good many years that lesions, which we may regard with assurance as tuberculous, are to be found in a large proportion of the bodies subjected to post-mortem examination, no matter what may have been the cause of death. These lesions are of all grades of severity. Some are, of course, those of active and fatal tuberculosis. But many more are of minor, or even minimum, size; and among them are caseous and calcareous foci in the lymphatic glands or great organs, scars in the apices of the lungs, and adhesions of the pleuræ. Many of these little lesions have, one believes, given no definite sign of their existence during life, and appear, when discovered, to be quiescent or healed. The evidence of their tuberculous nature varies in cogency, so that there is, doubtless, a margin of error in the estimates of their frequency. But many of them contain tubercle bacilli, visible under the microscope or capable, on injection into animals, of transmitting tuberculosis. There need not consequently be any doubt of the real nature of the majority of them. On the other hand, injection into guinea-pigs of emulsions of lesions, caseous or calcareous, and which may even contain plenty of well-formed bacilli, fail, sometimes, to infect. We may, therefore, safely conclude that many of these unsuspected tuberculous lesions are cured, while others are probably quiescent and capable, should favourable circumstances arise, of being raised to activity.

What proportion of people carry in their bodies tuberculous lesions cannot be stated with exactness; but we know that it is a large one. Statistics bearing on this point and based upon autopsies vary within wide limits, as indeed is inevitable. For while some pathologists have searched every gland and organ for traces of tubercle, others, with a more general aim, have been content with less thorough examination; and autopsy statistics, as Naegeli[1] pointed out, cannot be relied upon to determine such an issue as we are now considering, unless special care has been directed to the point in question. We are, therefore, bound to regard the higher estimates of those who have had this aim directly in view as more credible than the lower ones of general observers. Naegeli (1896–7), who was among the first to devote special attention to this subject, found signs of tubercle in 93 per cent. of the adult bodies which were included in a total of 500 hospital cases examined by him at Zurich. He, however, preferred to rely on his second series of cases, since these were examined with special minuteness; and among these were 284 adult bodies, of which only six were found entirely free from traces of the disease. If from these we exclude 63 in which the tuberculous disease had been the cause of death, there remain 221, in which tuberculous lesions of some kind were present in 97 per cent.

Quite recently an equally high percentage of tuberculous infection has been found by Reinhart[2] among the hospital patients in Bern. We may, therefore, accept these figures as correct for the hospital population of Swiss towns.

But we must be careful in drawing from them conclusions regarding our own people. For, in the first place, tuberculosis is much commoner almost everywhere on the continental parts of Europe than it is in England, and, in the second, as Naegeli did not neglect to point out, the poorer classes, from which the hospital patients mainly come, suffer far more frequently from this disease than do those in better circumstances.

There is a deduction, therefore, to be made—and possibly a large one—before these statistics can be applied to our own people. But these figures do not stand alone. Here at home, too, we know that tuberculous lesions, often unsuspected during life, are surprisingly common. We shall, therefore, probably be within the truth if we conclude that the majority of us become, at some time or another, infected with tubercle and develop lesions, of which we may or may not be conscious, but which would be revealed by post-mortem examination.

At what period of life is the infection acquired? To this question it is difficult to give an answer. Behring thought it was in infancy. But he seems to have been influenced in forming his opinion by the belief that the infection was caused by bacilli of bovine origin, taken in cow's milk, and in this we have now good reason to think he was mistaken. Naegeli himself found tuberculous infection minimum at birth and increasing rapidly in early life, until at eighteen the frequency of infection had nearly attained its maximum. In more recent times, several important investigations have thrown light on the frequency of infection at different ages. For the Local Government Board, Eastwood and F. Griffith, in London, and A. S. Griffith, in Cambridge, have carefully sought for tuberculous lesions, and, by guinea-pig inoculations, for tubercle bacilli, in the glands and organs of 215 children who died from any causes in general hospitals. There was no selection, but cases were taken as they came to post-mortem examination. The proportion of children found by these authors to be infected with tubercle bacilli is extremely high (60 per cent.). A very large proportion of cases of fatal tuberculosis is included in the series, which makes one suspect that, although there was no selection of the bodies for examination, there may, possibly, have been some selection, perhaps unintentional, of tuberculous children for admission to the hospitals. But, if for this reason we hesitate to use those figures as a measure of the frequency of infection in childhood, we may nevertheless employ them to illustrate the increase of infection as age advances. This increase is very clearly shown from the following table, which is extracted from these reports[3] :—

Age.	Number infected with tubercle bacilli.	Proportion infected.
0–2 years	6 out of 17	35 per cent.
2–4 „	18 „ 82	52 „
4–6 „	36 „ 62	58 „
6–10 „	39 „ 51	77 „
10–12 „	2 „ 3	—

Rothe's series of 100 children under five years of age shows a similar increase with advancing age in the proportion of those infected with tubercle bacilli.[4]

This increase is evident also in Ungermann's investigations for the Gesundheitsamt in Berlin, which were carried out, like those already referred to, by modern methods of culture and inoculation, as well as by the older researches of Ganghofer, Sehlbach, Hamburgher, Albrecht, and others, which were based only on anatomical investigation.[5]

From these researches it seems permissible to conclude that tuberculous infection is taking place all through the earlier period of life, and that the proportion of infected persons has reached almost to its maximum when the period of growth comes to an end. Whether infection or reinfection continues also during adult life, we have scant means of judging. But we suspect that it does so in some reduced degree ; for several lines of evidence tend to show that, after the period mentioned, tuberculosis infection is not very easily acquired. As examples of this evidence may be mentioned the common escape of doctors and nurses who attend on tuberculous patients, and of the wives and husbands whose marital partners are tuberculous.

The comparative immunity of the adult to new infection, if it is really a fact, may perhaps be accounted for by the immunizing effect of abortive infections acquired earlier in life; but, from what we know of the short duration of artificial immunity produced in calves by inoculation, this does not seem very likely, and I am more inclined to attribute it to the cessation of the strain made upon the constitution by bodily growth. But be that as it may, I think that we may conclude that infection with tubercle bacilli, though it does not entirely cease when adult age is reached, is nevertheless, like infection with most other diseases, less easily acquired then than in childhood and adolescence.

And yet, in spite of this predilection of tuberculous *infection* for early life, the great bulk of the deaths from tuberculosis occurs in the middle of life,* and this in spite of the fact that the duration of recognizable pulmonary tuberculosis (which is responsible for 77 per cent. (1915) of the mortality from tuberculosis of all kinds) does not, as a rule, exceed a few years. There would, therefore, seem to be reason to conclude from this, as well as from other lines of evidence, that in a considerable proportion of the cases of fatal tuberculosis a long period intervenes between infection and diagnosis.

From such considerations has grown up the view of the ætiology of tuberculosis, which I take to be that most widely held at the present time, and which may be put briefly as follows :—Almost all of us become infected with tubercle bacilli before we become adults, and most of us live to die in the end of other causes, without knowing that we have been thus infected. The fact of infection, then, matters little, since

---

* A word of caution is, perhaps, necessary here. Since it may not be sufficiently recognized, owing to greater attention being paid to death-rates than to actual numbers of deaths at various periods of life, how great is the number of deaths assigned to tuberculosis in infancy.

As is well known, the curve of the death-rate from tuberculosis throughout life shows two waves. The first occurs in infancy, and is high and narrow like a steeple. The second occurs in adult life, and is lower and broad backed, like a whale. The former crest barely extends over two years, the latter over many years, and may be said to embrace, in women, the period from 25 to 45, and in men, that from 35 to 65 (1901–1910).

But if we make another curve showing, not the death-rate (= the ratio of number of deaths to number of persons living at each age period), but the actual number of deaths attributed to the disease at the periods, the disproportion between the heights of the crests becomes greater, and the summit of the second crest occurs a little earlier (owing to the gradual diminution of the number of persons in each successive age period). The annual number of deaths assigned to tuberculosis in each of the first two years of life is twice as high as in any equal period of adult life.

But the period when the deaths are so numerous is, as we have said, short. It does not extend much over those two years. Already, in the third year, it is falling, and the decline continues rapidly for some years longer, so that the deaths during the years from 5 to 15 are at a minimum. On the other hand, the second wave is long. Its actual crest falls between 35 and 45 years, but from 20 to 30 the annual number of deaths is almost as large as between 35 and 45. In this period of life, then, from 20 to 45, there were assigned to tuberculosis during the years 1911–1915, 117,000 deaths, while those in children under five similarly assigned there were but 38,000. It is this that we have it is so common. What really determines whether we do or do not develop serious tuberculosis is our capacity for resisting the spread of the disease in our tissues.

A low degree of capacity for resisting the development of tuberculosis is partly inheritable; for which reason we so often see the disease attack many members of one family. But it is partly also acquired. Our capacity for resistance, be it high or low at the onset, varies from time to time with the circumstances of our lives. An attack of measles or influenza, or the exhaustion produced by parturition and lactation or by insufficient food, alcoholism or overwork may break down the resistance to the development of an infection which, otherwise, would have been abortive, and cause it to result in active tuberculosis. This theory may be summed up in a single sentence: "The seed comes to all, whether it takes root and springs up or not depends upon the soil."

THE INFLUENCE OF NUMBERS OF BACILLI IN THE INFECTING DOSE.

Let us now turn to consider how the comparatively new fact of the influence of numbers of bacilli in the initial infecting dose on the severity of the result bears upon this theory of the ætiology of tuberculosis.

First as to the fact itself:—It has come to light from many infection

in mind when we say that the great bulk of deaths from tuberculosis occurs in adult life.

It is difficult to account for the excessive mortality from tuberculosis which occurs during the first two years of life, and for its rapid decline. Too much reliance must not be placed on the actual figures, since it is at this time of life that diagnosis is most difficult and uncertain; but it can hardly be doubted that there is an immense mortality from tuberculosis in early infancy. This at once raises the question whether it may not be due to inherited infection; for though the mortality from tuberculosis during the first month of life is relatively small, yet the well-known inability of tubercle bacilli to develop in embryonic tissues may well be assumed to persist for a time after birth. But the fact seems to be that a large proportion of these cases, perhaps two-thirds of them, are due to the bovine type of bacillus, and, therefore, cannot be inherited.

We must, therefore, assume a very high degree of susceptibility to tuberculous infection during early life to the bovine type of bacillus, and if to infection with the bovine type, why not to that of the human type also? There seem, therefore, to be no solid grounds for attributing these deaths to inherited tuberculosis.

Average number of deaths per annum assigned to tuberculosis at different periods of life. England and Wales, 1911–1915.

1st month.	2nd and 3rd months.	4–6 months.	7–12 months.	1st year.	2nd year.	3rd year.	4th year.	5th year.
475	1,727	3,042	3,077	2,668	2,262	1,267	813	643

experiments with all kinds of pathogenic bacteria that, with all species of these microbes and almost all animals, there is a certain minimum dose, anything less than which fails to produce on injection a fatal result. This was, perhaps, to be expected; but I, for one, remember my surprise when I found that with even so deadly a microbe as the diphtheria bacillus and an animal so susceptible to its influence as the guinea-pig the maximum non-fatal dose could readily be determined and was not inconsiderable.

With other combinations of microbe and animal this is not always the case. I believe that any dose of tubercle bacilli, however small, whether of bovine or human type, will kill the guinea-pig on injection, and any dose of bovine bacilli, however small, will, similarly applied, kill the rabbit. In these instances, variation in the dose of bacilli injected affects only the duration of the disease, which is always fatal in the end. But with more resistant animals this is not so. You cannot kill the white rat by injecting (intraperitoneally) tubercle bacilli of any of the three types, with much less than the relatively enormous dose of 10 milligrammes of young bacilli (enough to kill most Jersey calves). And in the case of the calf, 1 mg. of bovine bacilli injected subcutaneously fails to produce progressive tuberculosis.

The following example may serve as an illustration: Four calves of similar age, size, and appearance were injected simultaneously under the skin with the same emulsion of tuberculous tissue. The doses varied in bulk, so that it was calculated that the calves received the following numbers of bacilli:—Nos. 1 and 2, eleven millions and three millions; Nos. 3 and 4, seven hundred thousand and ten thousand respectively. The first three animals developed severe general tuberculosis, and they were obviously just about to die of the disease when they were killed—54, 80, and 68 days respectively after inoculation. No. 4, on the other hand, was to all appearances quite well when it was killed 66 days after inoculation, and at the post-mortem examination " only a few small non-progressive calcareous foci were found in various organs, in addition to a calcareous local lesion and prescapular gland."[6]

In 1907, I reported to the Royal Commission on Tuberculosis, which was then investigating the relation of bovine and human tuberculosis, as follows:—

> " The influence of the numbers of tubercle bacilli on the severity of the resulting disease became apparent at the commencement of our work, and a series of guinea pigs injected by me showed that the duration of life after injection bore a very close relation to the quantity of tuberculous material injected, whether this was introduced into the subcutaneous tissue or into the peritoneum. It was not, however, until the results of injecting bovine animals began to accumulate that the full effect of variations of dose became apparent, and it was evident that a tubercular virus which was capable of killing bovine animals within a few weeks when injected in large doses would cause only minimal lesions, limited and non-progressive, in these animals if a small dose were given."[7]

For the mass of facts upon which this statement was based the table of calf inoculations on p. 1035 of Vol. II. of the Royal Commission's Interim Report may first be cited.[8] That table shows that, as a general rule, to which there were few exceptions, doses of tuberculous tissue emulsion which contained more than 10 million tubercle bacilli, when injected into Jersey calves caused acute general tuberculosis which proved fatal, or appeared to be about to do so when the animals were killed some four to six weeks later, while, on the other hand, lesser quantities produced results much less severe, and doses containing less than one million bacilli caused, as an almost invariable rule, tuberculosis of such moderate degree as often to affect the general health of the animal to scarcely an appreciable extent. Confirmation of the general principle revealed by these facts may be found also in A. S. Griffith's work for the Commission.[9] But what is perhaps the most striking evidence, and that which certainly impressed me most at the time, is the large double series of injections of calves (made by Griffiths and myself) with 10 and 50 m.g. of culture of tubercle bacilli.[10] Of those injected with the larger dose, 91 in number, only five survived the observation period of three months which followed the injections. All the rest died of acute tuberculosis, or were in a dying condition when killed, while of the 47 calves injected with 10 m.g. no less than fourteen survived this period, and many of these showed, on post-mortem examination, lesions of quite moderate severity.

All those experiments taken together form a large mass of evidence which proves conclusively, so far as the ox is concerned, that *large doses of (bovine) tubercle bacilli injected subcutaneously produce results which are far more severe and more rapidly and surely fatal than smaller doses, and that, in these animals, very small doses produce no serious results at all but only little scattered lesions, which soon undergo retrogressive changes.*

With other and more natural methods of infection, namely, feeding and inhalation, results of the same general character have been obtained by a number of observers, in the ox,[11] dog,[12] and goat.[13]

Thus we find that the various mammalian species may be divided, so far as their response to infection with tubercle bacilli of one or both types is concerned, into the highly susceptible and the comparatively resistant. The former class includes the rabbit (*a*), guinea-pig, and monkey, and the latter the ox (*a*), pig (*a*), dog, and rat. To the former, variation of dose makes little difference, and affects only the duration of the disease; the animals probably always succumb in the end. But to the latter, the resistant class, dose makes all the difference between life and death.

To which of these classes does man belong? It is true that the chimpanzee, man's nearest relative among the lower animals, behaves in this respect not otherwise than the rabbit and the guinea-pig, succumbing to the smallest doses of tubercle bacilli, whether human or bovine. But we must not be misled by specific relationships, which, contrary to what one would expect, offer no guide at all to susceptibility to bacterial infections.† The evidence of the post-mortem room, to

---

(*a*) To bacilli of bovine type only.

† Many examples might be given, but it will probably suffice to cite the classical example of the extreme susceptibility of the white mouse and the immunity of the field mouse to mouse septicæmia. (*See* R. Koch on *Traumatic Infective Disease*, transl. by Watson Cheyne. *New Syd. Soc. Trans.*, 1880 Vol. LXXXVIII., p. 39.)

which we have already alluded, shows conclusively that man often resists and triumphs over an infection with tubercle bacilli. As we have seen, there is reason to think that the majority of us become affected with tubercle at some time or other of our lives, and yet less than 10 per cent. (9·7 per cent. in 1915) are certified to die of the disease. In man, too, tuberculosis not unfrequently assumes a chronic form, as in the ox, and may even be not incompatible with a certain amount of bodily activity. It is as good as certain, therefore, that if man was subjected to experiment like the other animals mentioned, he would be found in the same class as the ox and the goat, and not in that which includes the highly susceptible chimpanzee and other monkeys.

These, then, are the principal facts concerning the comparative effect of large and small doses of tubercle bacilli. Let us now proceed to inquire how they bear on the theory of the ætiology of tuberculosis, and, particularly, on the question where serious infection is most commonly contracted.

Putting aside bovine tubercle bacilli, which are responsible, probably, for some 6 or 7 per cent. of the total mortality from tuberculosis, and that mostly in infancy and early childhood, there remains only the human tubercle bacillus, and of this the sole important source is the tuberculous lesion in pulmonary phthisis.

Two rival views have, in modern times, been held with regard to the means by which the bacilli are distributed from these centres so as to infect new victims. Cornet held that tuberculous sputum became dried and distributed in the form of dust; Flügge that droplets of fluid, emitted from the mouth in coughing or even in laughing or speaking, might contain the bacilli and cause them to be carried in the air for certain distances.*

Both theories are supported by numerous experiments, and that of Flügge has been greatly strengthened by the more recent work of Chaussé.

The most important difference between these rival theories would seem to be that the one provides for the bacilli being carried much greater distances from the patient, the source of supply, than the other; for it is obvious that droplets of fluid, however fine they may be, cannot be supposed to be carried to such distances as finely divided particles of dust. Cornet, it is true, denied that infectious matter was ubiquitous, and regarded it as acting in the chamber of the house of the consumptive. He held that the sputum became dry on the pocket-handkerchiefs and bed-clothes, and so escaping polluted the air in the neighbourhood of the patients, and he proved his case by the injection of guinea-pigs with dust collected in apartments and hospital wards occupied by such patients, as well as by control experiments with dust taken from rooms where there were, or had been, no such persons. Fränkel, in his *Text Book of Bacteriology*, after expounding Cornet's views, concludes that " tuberculosis is a contagious disease," that " every phthisical patient indicates an immediate danger for those around him," and, he adds, that " we should bear in mind that in intercourse with tuberculous persons we stand nearer to fate than otherwise."[14]

---

* One of Flügge's pupils placed Petri dishes containing culture media in various parts of the theatre. Having washed his mouth out with a suspension of *B. prodigiosus*, an easily distinguished species which is not found in the air under normal conditions, he proceeded to deliver his lecture, and afterwards collected the dishes and incubated them. The growth of colonies of the bacillus on several of the plates showed conclusively that bacilli might be distributed from the mouth in this way and carried considerable distances (Laschtschenko *Zeitschf. f. Hygiene*, 1899, Vol. XXX., p. 125) The experiment was successfully repeated by Gordon (Supp. Ann. Rep. Med. Off., Loc. Govt. Bd., 1902–3, p. 425).

But while Cornet regarded the infective action of dried sputum as operative mainly in the immediate surroundings of the patient, and so in this agreed with Flügge, there has come, I think, to be widely accepted another view of dust-borne bacilli, which regards them as being carried to far greater distances. The phthisical patient is not always bed-ridden, but, unfortunately, very much at large, and much tuberculous sputum gets deposited in our streets and public places. This, ground under foot, becomes dried and distributed by the wind broadcast. So that those who hold the view that tuberculosis is caused by bacilli which get suspended in the air in this manner believe that tuberculous infective matter is ubiquitous, and they derive confirmation for their views from the extreme frequency of infection.

But it is evident that the bacilli so widely distributed must become diluted, and probably, as Burnet[15] has suggested, reduced in vitality. It therefore seems reasonable to suppose that anyone breathing air so polluted can get but a small dose of bacilli at any one time, and those more or less enfeebled. It is here that the facts ascertained as to the influence of large and small doses comes to bear, and it seems that we may conclude from them that infection brought about in this way is very likely to produce the abortive lesions which post-mortem examination has shown to be so common.

Thus, I am led to oppose the view that the infection of tuberculosis is ubiquitous, and that whether we live or die of the disease depends solely on our powers of resistance. Rather, I think, it depends as much on the dose, and that the danger is concentrated in the near neighbourhood of the consumptive patient and diminishes with distance.

On the question of contagiousness of phthisis, opinions held at different periods have been poles apart. In the early part of the 19th century, the extreme views which had prevailed previously were, under the influence of the new pathological teaching,* passing away. Laennec (1781–1826) did not think that consumption was contagious, at least in France, though he admitted that it might become so under certain circumstances.[16] In this country, similar views held the field, and as the century wore on all belief in contagion seemed almost to disappear, until at length, at the time of the discovery of the tubercle bacillus (1882), the situation may fairly be summed up in the words of Koch, who said that though "many practical men had no doubt kept in mind the possibility of infection, yet with the medical profession generally phthisis was regarded as the result of constitutional peculiarities rather than of direct contagion."[17]

---

* The theory of the origin of tubercle which was widely accepted during much of the 19th century regarded this morbid product as the result of *deposits* from the blood-vessels of coagulable lymph, which, in consequence of some defect in the constitution of the individual, failed to pursue its normal course of organization, but remained instead in its primitive condition, or underwent degeneration. The best exposition of this theory I can find is in

Such is the effect of the mental spectacles with which we are fitted by our age and circumstances that Forbes (1834), the learned translator of Laennec, stated that, among the many thousand cases of this disease which he had attended, he had never witnessed one unequivocal case of contagion (*l.c.*, p. 304), and Bennet (1884),[18] under the influence of the pathological theories of his day, though he admits that he had himself known "the relatives of consumptives, who had lived with them and nursed them, become attacked with phthisis," could only see in this the influence of imperfect ventilation.[19] He admits that the vigorous country-bred girls of Mentone had become much more frequently attacked by pulmonary tuberculosis since the place had become the resort of consumptives, and especially those girls who had become washerwomen; but, he asks, is it not because they formerly pursued an open-air agricultural life, whereas they now "work in

---

the works of Sir James Clark, especially in his *Influence of Climate on Chronic Diseases of the Chest, etc.*, 1829, and his *Treatise on Pulmonary Consumption*, 1836 (p. 258). Clark tells us that the theory was based (as held in England, I presume, for Laennec held very similar views in France even earlier than this) very largely on the investigations of T. I. Todd, and he included a detailed contribution from this author in his *Influence of Climate* (p. 233).

Todd had considered the question of the nature of nutrition of the living tissues, and had drawn his conclusions from a histological study of the development of the chick in the egg and the repair of injured tissue. In either case he saw the development of organized tissue of complicated structure from a homogeneous or structureless matrix, and he concluded that the normal process of nutrition was of the same kind, and its first step the pouring out of coagulable lymph, which afterwards developed into organized structure. But in those who became tuberculous there was, according to Clark, "a morbid condition of the general system" or "tubercular cachexy," which might be either inherited or acquired, and which caused the lymph, poured out according to the ordinary needs of nutrition, or, according to some, as the result of inflammation, to be "deficient in the normal degree of vitality, and hence incapable of organization." (*Influence of Climate*, p. 234.)

The English physicians, for the most part, rejected the inflammatory origin of tubercle, and in this they followed Bayle and Laennec (*l.c.*, p. 271), who, on this point, strongly opposed his rival Broussais.

Finally, the theory was overthrown by Virchow, who showed that tubercle arose, not in a structureless matrix, but as an organized growth of cells, and that the structureless character so often observed in it was not a primary but a secondary condition, the result of degeneration.

badly ventilated damp rooms, instead of in the open air? Is it not again a question of pre-breathed air, not of contagion?"

To do Bennet justice, it should be added that he is a very clear and candid writer, and hides nothing that might have been advanced against his own theories. Moreover, he was obviously shaken by Villemin's experimental transmission of tuberculosis to dogs by means of a spray charged with the contents of a phthisical cavity. He even admits in one place the possibility that "phthisis *may* (his own italics) be communicated by breathing constantly air saturated with the purulent secretions of advanced phthisis," or "the purulent spray from a patient in a badly ventilated room," but he thinks it "probable that any kind of pus, whether with bacilli or not, so breathed might have the same result," and he hastens to add that he had never once seen a case that could lead to the suspicion of communication when the room inhabited by the invalid had been well and freely and constantly ventilated. "Under such circumstances," he affirms, "no one need fear to live with a consumptive relative." (*Pulm. Consump.*, p. 53.)

Only once had he seen a case "which he could refer to contagion; and even that case might be otherwise explained. This case was that of a young healthy officer who came from New Zealand with his wife—the latter in advanced decline." "She had large cavities in her lungs, and spat," so he told Bennet, "an immense quantity of matter. Husband and wife lived together in a small cabin only a few feet square, day and night, with the window generally shut, for four months; and she died a few days after landing in England. A short time afterwards, he showed signs of pulmonary consumption, which drove him to Mentone in the following winter." (*Loc. cit.*)

On the other hand, we find at about the same period Dr. Sprigge, of Great Barford,[21] 1883, relating the history of the consumptive dressmaker whose three healthy apprentices, each from a different village, consented to remain in the house and sleep with their employer one week at a time, all of whom became attacked with phthisis and died of the disease within two years. Again, we have Hermann Weber's (1874) dramatic instances of transmission of infection from husband to wife, of which it will be sufficient to recall two. In the first, a consumptive patient married four wives in succession, and all these latter died rapidly of phthisis. In the second, three wives of another consumptive perished in like manner.[22]

Since 1882 the opinion that tuberculosis is exclusively due to constitutional weakness has slowly given way, as it was bound to do when once it had been proved to be associated with a specific microbe capable of causing the disease on inoculation into suitable animals. But the swing of the pendulum has been slow, and at the present day medical authorities are much divided concerning the relative importance of "seed" and "soil." On the one hand, we have known men of eminence, like the veteran Dr. A. Ransome and the late Dr. H. Bulstrode, strongly opposed to the idea that tuberculosis is contagious, and on the other, younger men, like a tuberculosis officer of my acquaintance, who see evidence of contagion in the majority of their cases.

For my part I cannot lay claim to clinical experience, but I have lost friends from tuberculosis who, for physical development, were among the finest specimens of their race; and I can see that Laennec was right when he said that phthisis is not confined to persons possessing the particular constitution described by Aretæus, but, on the contrary, individuals of this kind form the smaller number of consumptive patients and " this terrible malady frequently cuts off those who are the most robust and have the best bodily configuration."[23] Consumption, then, is not entirely a matter of predisposition; or, if it is, it is a predisposition not necessarily associated with any other weakness.

But if consumption attacks not the weak and the delicate only but many of the strongest also, evidence of contagion, we must admit, does not often lie on the surface. Such cases as those which have previously been mentioned are, I suspect, the exception, and we may often seek in vain for the origin of the disease. But there may be a good explanation for this. We may agree with Portal that " in estimating the starting point of tubercular disease we have often to look, or refer the patient back, to early symptoms long forgotten." The date of infection, then, is often remote from the date of development of serious disease, and by the time that a diagnosis is made the circumstances attending the period of infection can no longer be recovered. But consumption may be none the less contagious for that—suppose, for example, small-pox had an incubation period of some years, who would suspect its contagion?

Again, take the alleged escape of wives and husbands who have married tuberculous partners, and of the doctors and nurses attendant on consumptive patients, may not their escape largely be due to the fact that they have already passed the most susceptible age before they become exposed to infection from these sources? Moreover, in this connection we must not lose sight of the possibility—though we do not as yet know what degree of importance to attach to it—that repeated small doses of tubercle bacilli may bring about, and maintain, a state of increased resistance. This principle would seem to be applicable especially to marital infection; for, presumably, at marriage the patient has, as a rule, developed no active symptoms, or is as yet in an early stage of the disease, so that his or her partner is at first subjected to doses of bacilli in small numbers and which increase gradually, and, *pari passu*, with advance of resisting power. The conditions, then, would seem to be eminently favourable for the establishment of such immunity as tuberculosis is able to confer, and to the attainment of sufficient capacity for resistance before exposure to really formidable infection begins.

It is idle to tell me that tuberculosis is not contagious like small-pox or measles. The contagiousness is veiled by its long incubation period in many cases, and by the disposition to see in the spread of the disease through various members of a single family only hereditary predisposition, and which ignores the existence in such circumstances of conditions specially favourable to infection.*

It may, perhaps, be thought that I take an extreme position with respect to the question of contagion in tuberculosis. I myself do not think so, and I am prepared to allow great influence to individual susceptibility (have I not repeatedly seen two calves, apparently identical in every respect, receive identical injections, and yet one develop disease of much greater severity than the other ?) and to admit that a low degree of power to resist tuberculosis may run in families, may exist as a constitutional idiosyncrasy in certain individuals, and may be, in others, the result of certain temporary conditions, such as overwork. Moreover, though I believe firmly in the influence of dose of bacilli, I admit that I have no conception of what size the dose must be to affect seriously, on inhalation, a person of average resisting power. Such a dose for a calf, if given subcutaneously, would be 50 milligrammes, which seems a far larger amount of bacilli than is likely to be encountered even in the closest proximity to an advanced case of phthisis. But there is good reason to think that the minimum effective dose taken by inhalation is far smaller than that received by subcutaneous injection.

But suppose the minimum effective dose for the person of average resisting power to be too large to be encountered, and that to become consumptive it is necessary to have a low degree of resistance to tubercle. Even so, I think we must admit that for every degree in the scale of lowered resistance there will be a minimum effective dose and maximum non-effective dose; and in each case the larger or effective dose is more likely to be encountered near the phthisical patient than elsewhere.

If this is admitted, I have gained my point. The phthisical patient, then, especially in certain stages of the disease, must be regarded as dangerous, and we must take steps to secure such a measure of segregation as circumstances admit.

Those who are anxious to stamp out tuberculosis, or, at least, to accelerate its too deliberate decline, must decide whether to concentrate their efforts upon soil or upon seed. From the point of view of the soil, the disease has been fought for many years, and, it must be admitted, with a considerable measure of success. But the final overthrow of the adverse social conditions which make for pre-disposition is still a far-off goal, and if the expulsion of tuberculosis depends upon its attainment, we may well exclaim with Broadbent that we must then wait for the Millenium. On the other hand, in the matter of the segregation of the more dangerous cases of phthisis, but little up to now has deliberately been attempted; and such course of action is still strongly opposed by a body of opinion which refuses to see truth in the evidence that tuberculosis is contagious. If I have succeeded in bringing the doctrine of the influence of dose of bacilli into greater prominence, and so in weakening this opposition, I shall be content; for I hold that the time has come when segregation should be recognized as one of the leading principles in the campaign against consumption.

---

* Alfred Hillier related the following interesting history. A man died of phthisis, leaving a widow with three sons and two daughters. The eldest boy was sent to a boarding school, but the other five persons continued to reside in the house. Within seven years the two girls and both the younger boys died of pulmonary tuberculosis. The mother and eldest boy, who had been less exposed to infection than the others, alone remained. Hillier remarks that this, for years, appeared to him as a terrible instance of the influence of heredity; yet, he adds, what a false inference this may have been! (*Tuberculosis : Its Nature, Prevention and Treatment.* Cassell & Co. 1900, p. 81.)

Dr. Emmanuel, of Birmingham, also gave some very striking histories showing that what might, at first sight, appear as evidence of family predisposition could not, on careful investigation, be made to bear this interpretation, but were, on the contrary, clear instances of infection. *Lancet,* 1909, ii., p. 1369.)

REFERENCES.

1 Naegeli: "Ueber Häufigkeit, Localization und Ausheilung der Tuberculose. *Virchow's Archiv.*, Vol. CLX., p. 426. **2** Reinhart: "Anatomischer Untersuchungen über die Häufigkeit der Tuberkulose." *Corresp. f. Schw. Aertze*, September 8, 1918. Quoted from leading article in the *Lancet*, 1917, II., p. 611. **3** *Reports to the Local Government Board on Public Health, etc.*, N.S., No. 88. The table is compiled from that on p. i of the report, together with those for the ages 0–2 and 10–12 years given by A. S. G. on p. 122. **4** *Veröffentlichungen der R. Koch-Stiftung*, Heft 2, p. 9. **5** *See* table on p. 131 of my *Causation of Tuberculosis*. **6** *Roy. Comm. on Tub., 2nd Int. Rep.*, 1907. Appendix, Vol. III., p. 257, "The Influence of Dose." **7** *Ibid.* **8** *Ibid.*, Vol. II., p. 1035. **9** *Ibid.*, Vol. I., pp. 38 *et seq. See also* chart at end of the volume. **10** *Ibid.*, Vol. III., *opp.* p. 256. A combined chart of Griffith's experiments and my own will be found in my *Causation of Tuberculosis, opp.* p. 264. **11** Kossel, Weber and Heuss: *Tub. Arbeit. a. d. Kaiserl. Gesundheitsämte*, Heft 3, pp. 20, 40; *also* Weber and Titze, *Ibid.*, Heft 10, p. 146. **12** Titze and Weidanz: *Ibid.*, Heft 10, p. 146; *also* Findel: *Zeitschrf. für Hygiene*, Vol XL., p. 446. **13** Reichenbach: *Ibid.*, Vol. LVIII., p. 104. **14** *Trans. of Fränkel's*, 3rd Edit., by J. H. Lindsley, 1891, pp. 243, 244. **15** *Ann. de l'Institut Pasteur*, Vol. XXIX., p. 220. **16** *Traité de l'Auscultation médiate*. 1819. Eng. trans. by John Forbes, 4th Edit., 1834, p. 304 **17** *The Etiology of Tuberculosis*. Eng. trans. New Syd. Soc., 1884, p. 67. **18** Dr. J. H. Bennet: *Pulmonary Consumption*, 1878, p. 259, and the "Contagion of Phthisis," *Brit. Med. Journ.*, 1884, ii., p. 704. Dr. Bennet, of Mentone fame, must be distinguished from his contemporary (also a great authority on phthisis), Prof. Hughes Bennett, of Edinburgh, the introducer of cod-liver oil into this country. **19** *Pulmonary Consumption*, 1878, p. 50. **20** *Brit. Med. Journ.*, 1884, ii., p. 705. **21** *The Collective Investigation Record*, Record No. 255. *Brit. Med. Ass.* 1883, p. 82, and *Brit. Med. Journ.*, 1883, ii., p. 983. **22** *Trans. Clinical Soc., Lond.*, 1874, Vol. VII., p. 144. Speaking ten years later, at the College of Physicians, Weber said he had not since met in his practice any further striking cases of this kind, but he remained "convinced of the communicability of phthisis under certain conditions." *Croonian Lecture*, Roy. Coll. Phys. Smith, Elder & Co., 1885, p. 27. **23** Forbes's translation, *l.c.*, p. 306.

THE CHEMOTHERAPEUTIC TREATMENT OF GONORRHŒA.

By J. E. R. McDONAGH, F.R.C.S.

Surgeon to London Lock Hospital, etc.

INTRODUCTION.

THE mention of gonorrhœa almost always causes a look of despair on the face of the medical man nowadays, whilst 20 or 30 years ago it was considered no worse than a cold in the head. This difference of outlook is due to the over-treatment now in vogue. Too frequent and too strong irrigations, too much instrumentation, and too much "milking" of the penis by the doctor and the patient are the chief causes of the multitude of cases, which never get cured. Septic conditions of other organs in the body are not handled so roughly and injudiciously as gonorrhœa, for in these we have learnt that treatment is summed up in the words rest and cleanliness. In recent years, some of us have begun to realize that the cure of inflammatory conditions is to be sought *viâ* the blood stream, and that local treatment is of only secondary importance. I have long thought that the successful treatment of gonorrhœa would evolve from this conception, and in this article I will show, what can be achieved with chemotherapeutic drugs in their infancy, and what hope attends future research to perfect them. Before describing the drugs I have up to the present found most useful, I will give a short *résumé* of my theory of oxidation and reduction, for it forms the basis of all my chemotherapeutic research.

THEORY OF OXIDATION AND REDUCTION.

The human body, without any external assistance, is able to exhibit a certain resistance against any disease by means of what is best called the protective substance, which are the protein particles circulating in the blood stream. These particles have the power of oxidation and reduction. The following two diagrammatic formulæ will explain better than words how the oxidation and reduction processes take place *in corpore*—

$$\begin{array}{lllllllllll}
\mathrm{R.Fe(OH)_2} & + & \mathrm{HO.OH} & + & \mathrm{H.OH} & = & \mathrm{R.Fe(OH)_3} & + & \mathrm{H_2O} & + & \mathrm{OH} \\
\text{(iron protein,} & + & \text{(PEROXIDE)} & + & \text{(water)} & = & \text{(iron protein)} & + & \text{(water)} & + & \text{(active} \\
\text{or oxidase)} & & & & & & & & & & \text{oxygen)}
\end{array}$$

Oxidizing Action.

$$\begin{array}{lllllllllll}
\mathrm{R.S.S.R} & + & \mathrm{2H.OH} & = & \mathrm{R.S} & + & \mathrm{R.SH} & + & \mathrm{HO.OH} & + & \mathrm{H} \\
\text{(sulphide} & + & \text{(water)} & = & \text{(sulphur} & + & \text{(mercaptan} & + & \text{(PEROXIDE)} & + & \text{(active} \\
\text{protein or} & & & & \text{protein)} & & \text{protein)} & & & & \text{hydrogen)} \\
\text{reductase)} & & & & & & & & & &
\end{array}$$

Reducing Action.

It will be seen from these formulæ, that sulphur, a metalloid, provides the peroxide necessary for iron and water to interact and form active oxygen. If the oxidizing action of the protein particles is insufficient to prevent the host from becoming infected, they in time so alter their stereo-chemical molecular configuration, to approach as nearly as possible that possessed by the parasite, a phenomenon known as specificity.

This action, one of the substratum in contradistinction to the actions of oxidization and reduction, which are only surface actions, increases the adsorptive capacity of the protein particles, thus enabling them to deprive the parasites more readily of their oxygen. As we know practically nothing about this change in the substratum, we can do no more than increase the surface actions, which can be done by various oxidizing and reducing chemotherapeutic agents. When a patient becomes infected with a disease, the protein particles, besides altering in the way just described, may in addition be increased in number and size. These three changes vary according to the cause of the infection, being most pronounced in protozoal infections, which cause a general infection, and least pronounced in bacterial infections, which cause only a local infection. As has already been stated, chemotherapeutic agents can be employed to increase the surface actions of the protein particles; but, a most important point to remember, they can destroy the protective substance by the use of too many and of too big doses, because in acting they send some of the protein particles, which are colloidal, into true solution, in which form they cease to be protective.

It follows from this, that in localized bacterial infections, in which the amount of specific protective substance is small, such as in gonorrhœal urethritis, great care must be exercised in the number and doses of the injections prescribed, for fear of sending this small quantity into true solution, or producing what is often called a negative phase.

Before trying manganese, the metal I found to be the most useful, I experimented with copper, which is a common oxidase in certain invertebrates, but the results were uncertain. I chose manganese for two reasons; first, because it is the most important oxidase in plant life, from which animal life in the process of evolution has doubtless sprung; secondly, because it is one of the few metals, which are capable of existing in the form of two easily reversible hydroxides, as shown in the following formulæ :—

$$\underset{\substack{\text{(di-valent}\\ \text{manganese}\\ \text{hydroxide}\\ \text{(oxidase)).}}}{R.Mn(OH)_2} \underset{+}{+} \underset{\text{(peroxide)}}{HO.OH} \underset{+}{+} \underset{\text{(water)}}{H.OH} = \underset{\substack{\text{(tri-valent}\\ \text{manganese}\\ \text{hydroxide)}}}{R.Mn(OH)_3} \underset{+}{+} \underset{\text{(water)}}{H_2O} \underset{+}{+} \underset{\substack{\text{(active}\\ \text{oxygen)}}}{OH}$$

$$\underset{\substack{\text{(tri-valent manganese}\\ \text{hydroxide)}}}{R.Mn(OH)_3} \underset{+}{+} \underset{\substack{\text{(active}\\ \text{hydrogen)}}}{H} \underset{=}{=} \underset{\substack{\text{(di-valent manganese}\\ \text{hydroxide (oxidase))}}}{R.Mn(OH)_2} \underset{+}{+} \underset{\text{(water)}}{H_2O}$$

Parasites, to save their active oxygen, exhibit a strong reducing action ($HO.OH + H^\circ$) on their surface. The protein particles kill the parasites by oxidation, an action, which probably takes place in the following way. The active oxygen (OH') neutralizes the active hydrogen (H°) on the surface of the parasites. The parasites, deprived of their active hydrogen, are unable to convert their tri-valent metallic hydroxide into the di-valent form, with the result that the formation of active oxygen is prevented, because it is only the di-valent metallic hydroxide, which acts catalytically as the oxidase. It will be noticed in the formulæ given for the oxidizing and reducing reactions, that it is only the metal and metalloid which are catalysts, while the peroxide is capable of being used up. This is what apparently happens to the protein particles when a disease becomes chronic. As the peroxide is formed by sulphur, it will be understood why I introduced intramine, a benzene sulphur compound, and advise its use previously to that of an oxidizing agent in all chronic infections. What it comes to is this, that oxidizing or metallic drugs are most important in the acute and subacute stages, while reducing or metalloid drugs are most important in the chronic stages; but as reduction is only a subsidiary action to oxidation, in all stages oxidizing drugs are required.

URETHRITIS.

The whole success of the treatment of urethritis depends upon the celerity with which a patient begins his treatment after the onset of the discharge. Never more than two irrigations *per diem* should be used, and in many cases only one is required. No irrigation should ever be so strong as to cause pain, or a burning sensation when the patient next passes his water. Furthermore, no irrigation should be sent back into the bladder, so long as the anterior part only of the urethra is involved. Finally, the prostate, except in a few obvious instances, should never be examined, and no instrument should be passed *per urethram* until the discharge has quite or almost stopped.

In acute anterior urethritis, the patient should irrigate twice a day with a 1 : 8,000 solution of potassium permanganate (irrigation A). An alkaline mixture, containing 30 grains of sodium bicarbonate, should be taken daily, together with some aperient medicine. Attention should be directed to the diet, and the patient prohibited from taking active exercise. It is also a good plan to wear the penis on the abdomen, for this position diminishes venous congestion. When the discharge has become mucopurulent, the strength of the potassium permanganate solution should be increased to 1 : 4,000 (irrigation B), and when the discharge is slight or there are threads in the urine, the patient should irrigate once or twice a day with a 1 : 8,000 solution of zinc permanganate (irrigation C).

When both portions of the morning urine (two-glass test) are clear, irrigations should be stopped, and the patient made to take active exercise. If no discharge is visible during the next three days, the patient can be discharged, provided a rectal and a urethral examination show there is nothing abnormal. There are three methods of injecting colloidal manganese* intramuscularly: (1) in small doses; (2) in gradually increasing doses; (3) in a concentrated form. I will cite a typical case of each.

CASE 1.

Day.	Irrigation.	Discharge.	Urine.	Remarks.
			Portion—	
1st -	A	Pus +++ - - -	1st: Thick - 2nd: Clear.	1·0 cc. coll. Mn.
2nd-	A	Discharge less.		
3rd -	A	Pus ++ - - -	1st: Thick - 2nd: Clear.	1·0 ,,
5th -	A	Pus + - - -	1st: Hazy - 2nd: Clear.	1·0 ,,
8th -	B	Mucopurulent - -	1st: Hazy - 2nd: Clear.	1·5 ,,
10th -	B	Slight mucopurulent -	1st: Threads. 2nd: Clear.	
12th -	C	No discharge - -	1st: Clear - 2nd: Clear.	2·0 ,,
14th -	C	No discharge -	Urethra and prostate normal.	
15th -	—	Discharged from hospital.		

CASE 2.

Day.	Irrigation.	Discharge.	Urine.	Remarks.
			Portion—	
1st -	A	Pus +++ - - -	1st: Thick - 2nd: Clear.	1·5 cc. coll. Mn.
2nd-	A	Pus ++ - - -	1st: Thick - 2nd: Clear.	1·5 ,,
4th -	A	Pus + - - -	1st: Hazy - 2nd: Clear.	2·0 ,,

---

* The colloidal preparations mentioned in this article are sold under the name "Collosol," and supplied by the Crookes laboratories.

Day	Irrigation.	Discharge.	Urine.	Remarks.
6th -	B	Mucopurulent - -	Portion— 1st: Hazy - 2nd: Clear.	2·5 cc. coll. Mn.
8th -	B	Slight mucopurulent -	1st: Threads 2nd: Clear.	3·0 ,,
10th -	C	No discharge - -	1st: Clear. 2nd: Clear.	
12th -	C	No discharge - -	Urethra and prostate normal.	
14th -	—	Discharged from hospital.		

CASE 3.—(*Concentrated Form of Colloidal Manganese.*)

Day.	Irrigation.	Discharge.	Urine.	Remarks.
1st -	A	Pus +++ - -	Portion— 1st: Thick - 2nd: Clear.	0·5 cc. coll. Mn.
2nd -	A	Discharge much less.		
3rd -	B	Mucopurulent - -	1st: Hazy - 2nd: Clear.	0·5 ,,
5th -	C	Slight mucopurulent -	1st: Threads 2nd: Clear.	0·5 ,,
7th -	C	No discharge - -	1st: Clear - 2nd: Clear.	1·0 ,,
9th -	C	No discharge -	Urethra and prostate normal.	
11th -	—	Discharged from hospital.		

It must be remembered, that these are only type cases of anterior urethritis, and that every case must be treated individually. The first course is always safe, though not invariably effectual; the second produces at times splendid results, but, should the urethritis be on the point of becoming posterior, it may precipitate this and hasten the onset of an epididymitis. The third course is safe, and gives by far the best results. The concentrated form is supplied in two solutions, the one clear, the other light yellow or brown colour, which have to be mixed in the syringe just before being injected. The other forms of manganese are apt to become oxidized if exposed to the air, and when this change occurs the therapeutic action of the drug is diminished. In the concentrated form, oxidation does not take place if the mixture is injected immediately; it is, moreover, alkaline, and 0·5 cc. corresponds to 1·5 cc. of the ordinary emulsion. The only disadvantage the concentrated form has, is, that it is more painful and produces a greater reaction, in the form of a rise in temperature, general malaise, and pain in the region of one or both kidneys. I have given a few thousand injections of colloidal manganese, but have never once known it do any harm.

If the discharge has not ceased by the fourteenth day, the patient should take internally 60 grains of sodium bicarbonate *per diem*, and receive on the same or following day 0·25 cc. of a 0·2 per cent. or 1·5 cc. of a 0·04 per cent. emulsion of colloidal (collosol) antimony. An alternative course is to stop all intramuscular injections for a week, and then to repeat at somewhat shorter intervals a similar course of manganese injections. If colloidal antimony is used, a second injection of double the initial dose should be given, after an interval of three or four days.

Should the patient during a course develop acute posterior urethritis, cowperitis, prostatitis, vesiculitis or epididymitis, all treatment must be stopped, the patient confined to bed if possible, and put on large doses of sodium salicylate and potassium iodide or colloidal (collosol) iodine. In four or five days' time, the patient should irrigate the whole urethra, take internally 60–90 grains of sodium bicarbonate *per diem*, and be injected with another course of colloidal manganese. Previous treatment with manganese does not militate against its value when it is again employed, and the varied use of manganese and antimony helps the action of the other. Another plan, very efficacious if time is an important factor, is to inject 2·5 cc. of intramine the moment a complication sets in, because the onset of a complication under such circumstances usually signifies the too active use of the oxidizing agent.

In acute posterior urethritis, the patient should irrigate the whole urethra with irrigation A twice a day, take salicylates internally, and attend to his bowels and diet. When the pain and frequency of micturition have disappeared and the discharge has diminished, 60–90 grains of sodium bicarbonate should be taken internally, and the whole urethra washed out twice a day with irrigation B. When the discharge has become mucopurulent or only a gleet in the morning is visible, the whole urethra should be irrigated with irrigation C once or twice a day. When the discharge has completely stopped, the prostate and vesiculæ seminales should be examined, and massaged twice a week if found infected. The urethra should be examined, and, if necessary, dilated two or three times a week.

So far as the injections are concerned, I usually proceed as follows: First day, 1·0 cc. Mn., or 0·5 cc. conc. Mn.; third day, 1·0 cc. Mn., or 0·5 cc. conc. Mn.; fifth day, 1·5 cc. Mn., or 0·5 cc. conc. Mn.; ninth day, 2·0 cc. Mn., or 1·0 cc. conc. Mn.; thirteenth day, 2·5 cc. Mn., or 1·0 cc. conc. Mn. If after this the discharge still continues, I prescribe potassium iodide or colloidal iodine (ʒiii ter p.c.) internally, treat the urethra locally more vigorously, and inject the following doses of colloidal antimony; eighteenth day, 1·5 cc. of the

0·04 per cent. or 0·25 cc. of the 0·2 per cent. emulsion; twenty-second day, repeat same dose, or double it. If disease is still active, intramine should be instilled into the urethra and an intramuscular injection of 2·5 cc. prescribed on the twenty-sixth day, repeated on the thirty-first day, and followed by 3 cc. Mn., or 1·0 cc. conc. Mn. three days later.

Recurrent cases of urethritis should be treated like ordinary cases of posterior urethritis, and require no further comment.

In some cases of urethritis the discharge rapidly clears up, and a cure appears to have been made in less than a week, but after two or three days' rest from irrigations the discharge re-appears, due to a localized littritis; therefore, no case should be discharged too quickly, because if the littritis is attended to, there is no risk of the inflammation spreading or of a complication developing.

I will now say a few words about the treatment of the complications, which may be associated with urethritis. A common complication is peri-urethral abscess, and is troublesome because it may lead to a urinary fistula, which in some cases becomes permanent. Intramuscular injections of manganese will relieve the pain in 24 hours, and cause the swelling to abort if it contains no pus, or to point immediately if there is pus. Therefore, in all cases, provided manganese is injected quickly enough, an incision is never necessary. The following cases will serve as good illustrations.

Case 4.—A patient had a peri-urethral abscess just behind the corona, which had to be incised. A few days later, another appeared 2 ins. behind and another in the perineum. The day following the first injection of colloidal manganese (2 cc.), the patient was able to get up, and, after two further injections of 3 and 4 cc. respectively the three abscesses disappeared, except for a small sinus, which followed the incision of the foremost swelling. This sinus healed up after one injection of intramine and another of manganese.

Case 5.—A patient had had a perineal peri-urethral abscess, which had left a urinary fistula, through which pus still discharged. The patient had been under treatment for the best part of two years without much improvement. After four injections of manganese and two of antimony, the discharge stopped, but the fistula did not close. I then gave the patient two injections of intramine and a final one of manganese, with the result that within ten days the fistula had completely closed, and the patient was discharged.

These colloidal preparations are extremely useful in those cases of urethritis, in which the whole of the mucous membrane has become spongy as a result of too active irrigation treatment. They also relieve the pain and discomfort in cases of cowperitis and prostatitis. As a rule, the subjective and objective symptoms of a cowperitis disappear after the second injection of manganese. If the gland contains pus, the injections will bring it to the surface, and after a tiny incision the process will resolve. This is exactly what happens in cases of bubo, a condition by no means always the result of a soft sore infection, for it may occur in gonorrhœa, scabies, impetigo, etc. If the lymphatic glands are not purulent, manganese will cause the trouble to abort, but if they contain pus, pointing will immediately occur, and resolution is just as rapid after a small incision has been made.*

Prostatitis responds in the same way as cowperitis and bubo, and it is extraordinary how quickly the subjective symptoms disappear in cases of prostatic abscess. One of the most troublesome complications of an acute or subacute posterior urethritis is retention, a condition due to inflammation of either the verumontanum or the middle lobe of the prostate. Although under ordinary circumstances a catheter has to be passed, as often as not the process has to be repeated once or twice daily for several days, which in an inflamed urethra may prolong the gonorrhœa for several weeks or even months. I have had four cases, in which an injection of manganese so relieved the patient, that it was only necessary to draw off the urine once. In two cases of cystitis, four injections of manganese enabled the patient to be discharged in a fortnight. In one case of hæmorrhagic prostatitis, in which blood had been passed *per urethram* for ten days, the hæmorrhage ceased 24 hours after 1·0 cc. of the concentrated colloidal manganese. Before ending the treatment of urethritis, I must refer to the clear or slightly opaque watery discharge and to the threads in the urine, which may persist for months and even years in patients who have had several relapses. They are often signs of over-treatment, and should not be looked upon as necessarily indicative of active infection. Another point to remember is that over 90 per cent. of the so-called fresh infections are really relapses of an uncured initial attack. When the urethra is examined for the first time, a gum-elastic olivary headed catheter (Teevan's catheter) should be passed. The frequent use of this instrument will soon give the observer, by the sense of touch, the means of ascertaining if there is any folliculitis or perifolliculitis. Only when such a lesion has been diagnosed in this way, should a metal instrument be passed.

VESICULITIS.

Inflammation of the vesiculæ seminales is a more common complication of gonorrhœa than is usually supposed. Vesiculitis is frequently the starting point of arthritis, and is usually the seat of mischief in those cases which present a persistent urethral discharge, in spite of every form of treatment having been tried. In the acute cases, the patient usually complains of pain in his back, which he generally refers to his kidneys, there is frequency of micturition, and a heavy purulent precipitate in the urine. In the subacute cases, the urine is full of flocculi, and in the chronic, there may be a precipitate of particles, which resemble dust or boiled sago grains. Bimanual examination with one hand on the pubis, and the forefinger of the other in the rectum, will reveal in the acute cases a baggy mass above the prostate, and in the subacute and chronic an ill-defined swelling or cord, which appears to be continuous with and extended up from the apex of the prostate.

---

* When a gonococcal lesion becomes persistent, it is usually due to a secondary infection of staphylococci. This is probably the reason why manganese is so useful, for it seems to have a particularly decided action in staphylococcic infections (boils, etc.)—see *Medical Press and Circular*, December 5th, 1917.

Massage in all cases is necessary, the accompanying urethritis should be attended to, and manganese and intramine prescribed in the manner suggested for epididymitis.

EPIDIDYMITIS.

As a rule, an epididymitis follows upon an infection of the prostate or the vesiculæ seminales. It is frequently accompanied by a deferentitis, which causes the patient abdominal pain and sometimes leads to the diagnosis of appendicitis being made. When the vas deferens in the scrotum is inflamed, the surrounding structures are usually involved in the exudate, and to this condition the term funiculitis is applied. Before the testicle becomes swollen and acutely painful, the patient complains of heaviness of the organ and pain in the groin. If the patient is put to bed, irrigations stopped, ichthyol applied locally, salicylates given internally, and the testicles well supported, the following course of manganese will prevent the inflammatory condition from developing. First day, 2 cc. Mn., or 0·5 cc. conc. Mn.; third day, 3 cc. Mn., or 1·0 cc. conc. Mn.; and fifth day, 3 or 4 cc. Mn., or 1·0 cc. conc. Mn. On the second or third day the subjective symptoms usually disappear, and the patient is able to get up and resume his irrigations. If the epididymitis is well developed before the patient comes under treatment, manganese is best prescribed as follows:—First day, 1·5 cc. Mn., or 0·5 cc. conc. Mn.; second day, 1·5 cc. Mn., or 0·5 cc. conc. Mn.; fourth day, 2 cc. Mn., or 1·0 cc. conc. Mn. In many cases the pain disappears in 24 hours, and the swelling rapidly diminishes in a few days. If this happens, then 3 cc. Mn., or 1·0 cc. conc. Mn. should be injected on the sixth day, and 3 or 4 cc. Mn., or 1·0 cc. conc. Mn. on the eighth or ninth day. If the improvement is not rapid, 2·5 cc. intramine should be injected on the sixth day, repeated on the tenth day, and succeeded by 3 cc. Mn., or 1·0 cc. conc. Mn. on the thirteenth day. In the cases which rapidly improve under manganese, the course should be followed up with one injection of intramine and then by another one of manganese, because intramine prevents fibrous tissue formation, as well as the hard nodule in the lower pole of the epididymis; this, if bilateral, may render the patient sterile, and often harbours dormant organisms, which are liable to re-develop and cause one or several local recurrences for several years to come.

In subacute or chronic epididymitis, it is best to adopt the following course: First day, 2 cc. Mn., or 1·0 cc. conc. Mn.; third day, 3 cc. Mn., or 1·0 cc. conc. Mn.; sixth day, 2·5 cc. intramine,; tenth day, 2·5 cc. intramine; thirteenth day, 3 or 4 cc. Mn., or 1·0 cc. conc. Mn. If manganese is used incautiously in cases of urethritis, the onset of epididymitis may be hastened. In these cases it is best to give an injection of intramine at once, for it supplies the peroxide necessary for the oxidizing action of the manganese. Three days later, 2 cc. Mn., or 0·5 cc. conc. Mn. should be prescribed, followed by manganese or intramine according to the course the case takes. In every case in which the procedure can be adopted, it is a good plan to inject 1·5 cc. colloidal (collosol) silver into the swollen epididymis and to repeat this two days later.

Another excellent manœuvre is to puncture the epididymis with a sharp-pointed bistoury as soon as the swelling appears.

I have treated 79 cases of epididymitis on the above lines, and in the majority the patients were able to be up and to carry on their irrigations on the third day. In several of these cases, no nodule remained behind in the epididymis. The following case of a suppurative epididymitis, which led to hernia testis illustrates well what can be achieved with oxidizing and reducing agents.

Case 6.—Patient was admitted with a swollen testicle, which he had had for three weeks. Under further treatment for a fortnight, an abscess developed in the epididymis, which had to be incised. This led to a hernia testis, which failed to improve under local remedies. Every second day the patient received an intramuscular injection of colloidal manganese and colloidal antimony (0·04 per cent. emulsion) in each buttock as follows:—First day, 1·5 cc. of each; third day, 1·5 cc. of each; fifth day, 1·5 cc. of each; seventh day, 2 cc. of each; ninth day, 3 cc. of each. By this time all the swelling had disappeared, but a sinus still persisted. A week later 2·5 cc. of intramine were injected, which cured the sinus and caused all the induration to disappear.

I had another case, in which a sinus leading to the epididymis persisted for three months without healing. Under two injections of intramine and one of manganese, within ten days the sinus had completely closed.

It must be remembered, that the chemotherapeutic treatment of gonorrhœa is only an adjunct to the existing methods of treatment; therefore, the conjoined use of vaccines is not contra-indicated.

ARTHRITIS.

Gonorrhœal rheumatism, including arthritis, is a more common complication in military than in civil life, and in the former it frequently appears with the *first* attack, indeed, a few days after the onset of the discharge. In soldiers the condition is particularly severe, and, in many cases, ordinary treatment renders the patient unfit for active service again. In combatant soldiers especially, wasting is rapid, and the arthritis is often accompanied by keratosis blennorrhagica, affecting either the hands or feet, or the penis only (balanitis circinata). In these cases the patient may have bilateral conjunctivitis, and exhibit a slight lymphocytosis in his cerebro-spinal fluid, which rarely exceeds 16 cells per c.mm. As a rule, a patient with arthritis has either a prostatitis, a vesiculitis, or both, but extremely seldom an epididymitis. When the arthritis sets in, the discharge stops; indeed, the presence of arthritis may result in an apparent cure of the urethral trouble. If the arthritis develops while there is still a purulent urethritis, it is best to treat the patient with manganese first, and then with intramine if the joint trouble has not resolved, as follows:—First day, 1·5 c.c. Mn., or 0·5 c.c. conc. Mn.; third day, 2 cc. Mn., or 0·5 cc. conc. Mn.; sixth day, 3 cc. Mn., or 1·0 cc. conc. Mn.; ninth day, 2·5 cc. intramine; thirteenth day, 2·5 cc. intramine; sixteenth day, 4 cc. Mn., or 1·5 conc. Mn. In those cases of arthritis in which the discharge has vanished, or only persists as a gleet, the following course is the most serviceable:—First day, 2·5 cc. intramine; fourth day, 2·5 cc. intramine; seventh day 4 cc. Mn., or 1·5 cc. conc. Mn. The day after the first dose of intramine, the pain and swelling may disappear, and the patient may be able to move his joint for the first time for some days or weeks. Owing to too free movement the joint may become a little stiffer a day or two later, but quickly becomes normal again after the second injection. As the fluid rapidly disappears, adhesions tend to form equally quickly, therefore, it is imperative to commence massage, etc., as soon as possible. A gonococcal joint should never be kept rigid unless it is purulent, a condition which is fortunately very rare. If there is much fluid in a joint, it should be aspirated, but this procedure is seldom called for. I will now cite one or two illustrative cases.

CASE 7.—A patient contracted gonorrhœa for the first time. Four days after the onset of the discharge, which, by the way, was never particularly profuse, an acute arthritis of both knees and the left ankle set in. Three days later, the joints were much swollen and very painful, the superficial veins of the limbs stood out prominently, and the urethral discharge had become mucopurulent. The patient received 0·5 cc. conc. Mn., and 24 hours later the pain had diminished so much as to allow the patient to sleep. On the third day the same dose was repeated, with the result that the day following the patient was able to move his joints himself, and the swelling was considerably diminished. On the sixth day, 1·0 cc. conc. Mn. was injected, and this was followed by 2·5 cc. intramine on the tenth and fourteenth day respectively. On the eighteenth day, 1·5 cc. conc. Mn. concluded the injection treatment. The following day the patient was able to walk about the ward. Subsequent examination of the urethra and prostate showed nothing abnormal, so the patient was discharged on the twenty-fifth day perfectly well.

CASE 8.—Patient contracted his first attack of gonorrhœa, and four weeks later developed arthritis of both ankles and the right knee. He was in bed for five weeks, during which time he was treated with the ordinary remedies, and received, in addition, eight injections of a sensitized vaccine, which produced little or no improvement. Before the first injection of intramine was given, the joints were swollen, and the patient was unable to move them owing to the intense pain caused. The day following the first injection of intramine the swelling diminished, and the movements were free. Three days after two injections of intramine and one of manganese, the patient was able to walk about. An examination of the urethra and appendages revealed nothing abnormal, and ten days later, after a course of massage, the patient was able to return to duty.

CASE 9.—Patient was suffering from his first attack of gonorrhœa, which he had had for five weeks before he came under my care. When I first saw him he had arthritis of his cervical vertebræ (spondylitis deformans), and was unable to move his head in any direction. He also had arthritis of both wrists, fingers, the right knee, both ankles, and some toe joints. The joint trouble had been present for a fortnight. After the first injection of intramine, the patient was able to move his head in any direction. The day after the injection of manganese, which was prescribed on the third day following the second injection of intramine, the patient was able to walk about and look after himself, and a fortnight later he went to duty. This patient also had keratodermia blennorrhagica, which was limited to his penis.

In long-standing and recurrent cases, the combination of intramine with manganese will produce changes unobtainable with other methods of treatment, as the following case will show:—

Case 10.—Patient contracted his first attack of gonorrhœa, and within a week of its onset, both lobes of the prostate and the seminal vesicles became infected. A week later he developed arthritis of both shoulders, both knees, and both ankles. Under local treatment and sensitized vaccines the patient did not improve to any great extent; in fact, he had been bedridden for four months before he was treated with intramine and manganese. Two days after the last injection the patient was able to walk about the ward for the first time; and a week later he required no further attention. After a fortnight's convalescence the patient was able to do his ordinary work.

Even in cases in which osteo-arthritic changes have taken place, intramine will reduce the swelling and pain. In all cases, the intramine and manganese exert a beneficial effect upon the primary lesion (urethra, prostate, etc.). Should a gleet still persist after treatment, the urethra should be dilated and the prostate and seminal vesicles attended to, in order to prevent a recurrence of the arthritis. Intramine injected *per urethram* in these cases is very useful, but care should be taken that it does not get on to the scrotum or skin of the penis, for it is apt to cause a sulphur dermatitis. If the pain of intramine injected intramuscularly is objected to, the intravenous route may be employed, but the results obtained are not so striking.* If the latter is the chosen course, it is best to proceed as follows:—First day, 100 cc. colloidal iodine intravenously; second day, 100 cc. intramine (0·1 per cent. emulsion); sixth day, 100 cc. intramine; eighth day, 4 cc. Mn., or 1·5 cc. conc. Mn. Intramine usually produces a smart rise in temperature, sometimes to 104° F., but no attempts should be made to reduce it, because, generally speaking, those cases do best in which there is the greatest reaction. Up to the present I have treated 64 cases in the way described with uniformly good results. Out of this number 11 had keratodermia blennorrhagica, 22 bilateral conjunctivitis, and 3 developed iritis after conclusion of the treatment. In 41 cases it was the patient's first attack of arthritis, and in 38 the first attack of gonorrhœa. In all cases, it is advantageous to give colloidal iodine internally (ʒiii ter p.c.), and to apply Scott's dressing, colloidal collosol iodine oil, or unguentum guaiacol (30 per cent.), to the affected joints. Some of the most interesting points in connection with gonorrhœal arthritis are, that the discharge is often slight, that the onset of arthritis may precede a discharge in a relapsing case, and that recently cases have been common, in which an extremely severe polyarticular form has begun as early as the fourth day in the patient's initial attack. In cases of gonococcal endocarditis and septicæmia again, the discharge has been and often is insignificant. However well arthritis cases do under treatment, they should never be discharged before a thorough examination of the seminal vesicles and prostate has been made, because gonococci may lurk in these organs for years, and be the cause of recurrent iritis, without necessarily exhibiting local signs of activity.

---

* Intramine is now supplied in two solutions to be mixed immediately before use, a procedure which renders an injection practically painless.

DURATION OF TREATMENT.

Under ordinary treatment, the average stay in hospital of gonorrhœa patients is 49 days. About 15 per cent. relapse to the same hospital, a figure which is valueless, because it is impossible to say how many have relapsed to other hospitals, how many men who would have relapsed are killed, etc. Probably not 5 per cent. of the cases discharged are really cured. About 50 per cent. develop prostatitis, 7 per cent. vesiculitis, 15 per cent. epididymitis, and 2 per cent. arthritis. The results obtained by manganese (excluding the concentrated form) and antimony in 500 cases, 200 of which had been under ordinary treatment first and 300 of which had not been previously treated, were as follows:—Of those which had had treatment the average stay in hospital was 41 days. When manganese and antimony were prescribed, it was reduced to 13 days. The reason the figure here is high, namely, 54 days, is because only those cases which were hanging fire under the ordinary treatment, were taken in hand. The average stay in hospital of the new cases was 17 days. The total average relapse rate was 10 per cent., and the period at which the relapse occurred averaged four days after the patient was discharged. The relapses were all treated with the drugs, and their average stay in hospital was 12 days.

In the 300 new cases, 28 per cent. developed prostatitis, 1 per cent. vesiculitis, 4 per cent. epididymitis, and there was no case of arthritis. Those cases did best which had an anterior urethritis only on admission, and if such cases are always treated carefully and individually, there is no reason why the posterior part of the urethra should become involved, or a complication develop. In those cases which relapse, a localized littritis is usually to be found, and this explains why most of the cases relapse within a week of being discharged. Having now treated 100 cases with the concentrated manganese, the following figures show the results obtained. The stay in hospital averaged 12 days; 9 per cent. developed prostatitis, 2 per cent. epididymitis, while there were no cases of vesiculitis or arthritis. I am certain much better results than those I have given could be obtained, because in at least 70 per cent. of the new cases, the posterior part of the urethra was involved before the patient came under treatment.

Having in the meantime been obliged to suspend my research work, I throw out the suggestion that a profitable line of research, would be to prepare some organic preparations of iron and manganese, since both metals can exist in the form of reversible hydroxides, in order to see whether their action is greater than the plain metals in colloidal form.

SOME SUGGESTIONS FOR THE EXTENSION OF VACCINE THERAPY.

By HELEN G. LEYTON, M.D.
Oxford.

In the course of routine pathological work, undertaken during the last three years, a few cases have given such suggestive results that it seems advisable to put them on record. Taken in the aggregate, they indicate that more of the morbid conditions occurring in modern life are due to lowered resistance to well-known organisms than is generally recognized. The cases came under vaccine treatment for chronic throat and bronchial affections. After each injection, the symptoms of an accompanying disorder were accentuated to such a degree, that the patient noticed the connection between the vaccine injection and the increase of pain and tenderness in the affected region. In each case after the vaccine course was concluded, the intercurrent, as well as the throat or bronchial affection, was cured.

Case 1.—A. F. had had for some winters troublesome cough and a chronic pharyngitis. She was sent for vaccine treatment in 1915. I took cultures from both nose and sputum, and found that pneumococci and streptococci were constantly present. A combined vaccine was given. After each injection, the patient remarked that she had pain and tenderness in the pelvis and exacerbations of a salpingitis of many years' standing, dating from an attack of scarlet fever. Her doctor knew of this salpingitis, and as the pain and discomfort followed each of the first twelve injections I asked that a p.v. examination should be made. It was then found that the old-standing swelling and tenderness in the pelvis had practically disappeared. The vaccine was continued for another three months, and the salpingitis, as well as the throat condition, completely cleared up. It seems reasonable to suppose that the streptococcus had remained in the throat and tubes in this case since the scarlet fever attack, and that an earlier vaccine treatment might have prevented much discomfort. The case suggests, moreover, that vaccines may be of benefit in the more usual class of post-scarlatinal infection, *e.g.*, nephritis. Although I have had no opportunity of treating such cases, it is of interest to note that in some cases of trench nephritis, coming under my notice at the Killingbeck War Hospital at Leeds, an inflamed condition of the throat was present in all the acute cases. Vaccines were prepared for some of these, but, unfortunately, the investigations could not be completed.

Case 2.—C. Q., æt. 50, was a case of chronic pharyngitis with periodical attacks of bronchitis in the winter. A year previous to being sent to me for vaccine treatment, she had been operated on for gastric ulcer and had had her appendix removed. When she came to me, she had all the symptoms of recurring gastric ulceration, but absolutely refused a second operation. Her doctor, knowing that my experiences were leading me to connect gastric ulceration and chronic infection of nose and throat, asked me to try vaccine treatment. Pneumococci, streptococci, and bacilli catarrhalis were present in the throat and sputum. Treatment was begun with a combined sensitized vaccine, and continued with an unsensitized for eight months, the dose being slowly increased. The result was most satisfactory, for although gastric pain and discomfort were pronounced after each dose for the first few weeks, the pain gradually decreased between the doses, and the patient had no return of severe symptoms.

In CASE 3, cardiac pain and distress disappeared in the course of treatment for bronchitis. This case had been seen by a well-known heart specialist ten months before starting vaccine treatment for bronchitis. She was told that the cardiac symptoms were due to some toxic affection. Two months after seeing the heart specialist, her appendix was removed for an acute attack. The cardiac symptoms abated during convalescence, but increased again during the following winter, until, in April, 1916, attacks of cardiac pain were occurring about once in ten days, and the patient could not walk more than a few hundred yards without experiencing tachycardia and respiratory distress. A vaccine was prepared containing the pneumobacillus of Friedlander, a diplococcus, and a streptococcus. The first injection consisted of 2½-million organisms, but the patient complained of so much cardiac discomfort for three days after the injection that the next dose was reduced to 50,000. Injections were then given weekly, the dose being raised only very gradually, and cardiac symptoms persisted during the first day after each dose for nearly six months, but the patient's general condition between the doses gradually improved. Vaccine treatment was continued for eighteen months, and the cardiac symptoms entirely disappeared, no discomfort of any kind being experienced during the last four months of treatment, nor have any symptoms recurred since treatment was stopped, although the patient has been subjected to severe mental and physical strain, and has done full-time war work. The cardiac specialist in this case thinks that the improvement was due to " delayed effects of the removal of the appendix," but I think that there is no justification for this view. It seems much more likely that the appendicitis was only an intercurrent local infection, probably due to one of the swallowed organisms, and that if this patient had begun treatment for her bronchitis a year earlier the appendicitis would not have occurred.

Taken together, these cases suggest that a lowered resistance to organisms, living in the respiratory passages, may not only be the cause of appendicitis, duodenal and gastric ulcer, salpingitis, nephritis, etc., but also that a routine examination of throat and sputa, and the treatment of chronic inflammations of the respiratory tract by vaccines may in a large measure prevent the occurrence of the above-mentioned diseases. Nowadays, sputa are regularly examined for the tubercle bacillus. If that is not present, cough mixtures are the standard method of treatment. It is exceedingly rare in hospital or ordinary general practice that a vaccine is asked for in cases of chronic bronchitis or pharyngitis. Yet in both types of case the patient is continually swallowing bacteria and their products, thus running the risk of absorbing toxins as well as infecting the various susceptible parts of the alimentary tract. What more probable than that in time, possibly after injudicious feeding and during a temporary absence of hydrochloric acid in the stomach, some of these bacteria should escape destruction and set up gastric ulceration and inflammation or, passing uninjured into the intestine, cause duodenal ulceration, biliary catarrh, or appendicitis?

THE TREATMENT AND DEGREE OF CURABILITY OF NEURASTHENIA PURA.

By SIMON HARRY BENNETT, M.D., Ch.B.

(*Glasgow.*)

In The Practitioner for February, 1918, I attempted to indicate the nature and mode of production of neurasthenia pura, and laid special emphasis upon the existence, almost universally in this disease, of a long prodromal period, the pre-neurasthenic state,—a fairly well-defined clinical entity in itself, hitherto not recognized as such.* Without a proper and true conception of the basal causative factors and rationale of the mode of production of a disease, any treatment of it, though possibly and admittedly efficient, must smack of empiricism. Whilst the therapeutic armamentarium of the physician is, in considerable measure, constructed out of empirical medicinal and other formulæ, it is so simply in virtue of the present-day limitations of his art, the tendency and striving being for ever after exactitude of comprehension of disease and its treatment on scientific and rational principles.

The syndrome constituting neurasthenia pura represents a transformation of normal psychic and nerve function into what may be called a sort of brain-riot, in which certain nerve centres and neuron systems have lost their physiological harmonious relationships and interdependence and have run amok. The multiplicity of symptoms in the disease is a necessary corollary of such functional derangement of the normal activities of the central nervous system.

The most scientific and usually most effective treatment of any disease must take full cognizance of its mode of evolution, and, therefore, must attack the basal pathogenetic factors; symptomatic treatment is usually an acknowledgment of therapeutic helplessness. The wonted acceptance of a so-called classic treatment, such as the Weir-Mitchell method (which I believe can claim more failures than cures in this disease), as the last word in the treatment of neurasthenia, because it is copied from text-book to text-book, and has become a fashionable and expensive institutional treatment, accessible chiefly to those with means, and, therefore, *un traitement de luxe* difficult to obtain by the multitude, shows how much we can be diverted from rational therapeutics by empirical doctrines.

Rational therapeutics demand at all times the existence of a distinct correlation between the nature and meaning of a morbid process and the *modus operandi* of any remedies designed to combat it, and it is in that spirit that the treatment of neurasthenia pura is attacked in the following pages.

---

* I omitted, when discussing the ætiology of the disease, to express the view that neurasthenia was more prevalent in town than in country life, a fact which supports my contention that a preponderating importance as a predisposing factor attaches to the question of environmental influence.

A.—THE TREATMENT OF CONFIRMED NEURASTHENIA.

Most text-books of medicine agree in saying very little about treatment, and monographs on the subject are very often bewildering in respect of the complexity of therapeutic injunctions recommended, some devoting many pages to the question of dietetics and other usually minor aspects of neurasthenotherapy.

The treatment of confirmed neurasthenia which I have employed in my cases, with almost invariably good results, differs in many essential particulars from that hitherto advocated by writers on the subject. By practically all authorities, the Weir-Mitchell method is acclaimed the treatment *par excellence* in most cases of the disease, whereas my experience of it is that in most cases of true neurasthenia it is the least likely to do good,* but may, indeed, actually aggravate the condition, alike by the time expended in its application, its helplessness too often to relieve it, and the uncomforting and depressing effect this has on the patient's belief in recovery. As is well known, the Weir-Mitchell treatment consists of complete isolation in a medical home or in lodgings away from all relatives and friends, complete rest in bed, systematic massage of the trunk and extremities, special attention to the diet and overfeeding, this being the most essential part of the treatment; electrotherapy may be employed as an adjunct, but it is not regarded as an essential or important part of the Weir-Mitchell method.

By way of contrast the cardinal points in the method that I have followed are, electrotherapy (D'Arsonvalization), which is by far the most important measure, isolation in the patient's home, psycotherapy, rest in bed at the beginning, which, however, has to be interrupted by regular visits to the physician, hydrotherapy, nutritious feeding, the systematic use of hypnotics to promote sleep, gentle exercises performed by the patient, during the period of isolation, in or out of bed, and taking the place of massage, and special measures for individual symptoms.

When a neurasthenic consults me for the first time, complaining of symptoms indicating the existence of confirmed neurasthenia, I lend a very patient ear to the history he has to give me, and thereafter make a very careful examination of all his symptoms. The examination is made as quickly as is compatible with accuracy, since the patient, being as yet a stranger to me (and *vice versâ*), passes through a considerable amount of mental anxiety and excitement whilst it is being conducted. I then, or not infrequently before my examination, put leading questions to him in order to extract how much of the complete picture of the disease his case presents. Very often by doing so one enumerates symptoms which the patient experiences or has experienced, but which he has either forgotten to recall or has not the courage to mention lest he be scoffed at. In that way, he is convinced from the start that his malady is completely understood, and consequently is inspired with the hope that he is likely to derive salvation from the treatment. I then proceed to point out to him the purely functional nature of his trouble, the complete absence of any organic lesion, and my conviction, founded upon past experience of exactly similar cases, that his complaint is amenable to treatment and, indeed, curable. These points should be recapitulated by the physician, during each consultation. The patient is next told that he will have to carry out rigidly certain specific therapeutic practices, now to be described in detail.

---

* The Weir-Mitchell method is certainly a classical treatment for hysteria, and in that type of so-called neurasthenia which has by some been designated "hystero-neurasthenia," it may act beneficially.

(a) *Electrotherapy*.

The average general practitioner has usually had no personal experience of, or is altogether unacquainted with, the value of electricity as a therapeutic measure in the treatment of functional nervous disorders, but in spite of this, is wont to regard it as a faddist treatment which he would fain relegate to the domain of medical quackery. Even physicians, who have specialized as such, are too often sceptical of the good effects of electrotherapy in neurasthenia, and employ it rather hesitatingly.

In my view, electrotherapy, in the manner hereafter set out, is a perfectly harmless treatment which, in virtue of its distinct ameliorating and curative value in neurasthenia, ought to be employed without hesitation. I have tried two forms of electrical treatment, galvanic and high-frequency. Descending spinal galvanism, applied for fifteen minutes or so three or four times weekly, will usually improve the nervous condition, but the progress is very gradual. There is nothing, I believe, that exerts more rapid and more lasting improvement in neurasthenia than high-frequency electricity; I put it in the forefront of all our remedial agents to combat the disease. I have employed D'Arsonvalization by the auto-condensation method (condenser couch) and local treatment over the spine by the brush discharge from a multiple metallic point electrode. The apparatus employed is the usual one, consisting of a 10-inch induction coil, worked from the continuous current main through a mercury jet interruptor, the terminals of which are connected to a battery of condensers arranged as plates; the inner coatings of these are charged by the induction coil, and connected with a spark gap, which is enclosed in a glass tube so as to deaden the noise, and the outer coatings are connected by a solenoid, from which two terminals lead off, one being connected to a metal handle, which the patient holds in his hand, the other to the metal back of a condenser couch on which the patient rests. The patient is placed in a shunt circuit with the solenoid, and it is due to the great resistance in the solenoid through its self-induction that the patient gets any current at all.

For the local treatment along the spine, the patient sits on the condenser couch whilst the operator moves the brush, which is connected with the knob on the top of the Oudin's resonator, up and down the patient's vertebral column, a few inches from the back.

When a patient submits himself for this treatment for the first time, I point out to him that he is absolutely protected from any danger of electrical shock. Before each application the patients must remove all metallic substances from their pockets and clothing. I give fifteen to twenty minutes on the couch, and four to five minutes with the brush along the spine, daily for the first week of treatment, six times during the second week, five times during the third week, four times during the fourth week, three times during the fifth week, and twice weekly during the next six or seven weeks. By the end of this time the patient can usually get along without further treatment; at any subsequent time a further course may be taken by the patient, if felt necessary. With the object of raising his state of mental unimpressionability he ought to be requested to make his visits to the physician, every now and again, at eventide, since the usual effects of daylight and darkness on our animal spirits undergo in the neurasthenic a positive perversion or deterioration; daylight loses its wonted charm to exhilarate, and night-time becomes much more depressing and the most phobially active period of the day.

I have employed high-frequency treatment extensively in my own house, and have never observed a single untoward result from its use. It is advisable that either the physician or a competent and sympathetic nurse should remain with the patient during the electrical applications in order to allay excitement. In most cases, after one or two applications the patient feels distinctly improved. My experience is that D'Arsonval high-frequency will improve, more or less, practically every case of true neurasthenia, and cure most, even without simultaneously submitting the patient to other therapeutic measures. Pure psychasthenics usually exhibit the greatest obstinacy to successful treatment. In young adults the improvement is rapid, in the middle-aged and elderly, in whom the katabolic processes are in the ascendency, and especially if complications such as emaciation, visceroptosis, etc., have existed for some time, improvement is naturally much more gradual. I would particularly emphasize that in cardiac neurasthenia, the sedative and ameliorating effects of these currents are verily " electrical "; I recommend it as an absolute specific for this variety of the disorder.

The following case, one of many, may be quoted to illustrate the high therapeutic virtues of D'Arsonvalization in neurasthenia pura, in spite of the lifelong and progressive existence of emotive aberration, and the predominance of cerebral symptoms.

T. B., ætat. 42, consulted me in April, 1914, for an attack of nervous breakdown which began a year previously. When a boy he was troubled with restlessness, being unable to sit in one place for more than half an hour at a time. He also often experienced during his boyhood days a strange feeling in his stomach (?) region—a sort of sinking sensation—which was relieved by the taking of food or by walking about. Constipation had always been troublesome. He started to work at the age of twelve.

Between his fifteenth and sixteenth years, attacks of lapse of memory supervened, the attacks lasting from one to five minutes; whilst these were on him he used to imagine that he was speaking to himself. These abnorma mental phenomena subsequently subsided. At the age of eighteen he began keeping company with a girl, but " gave her up " at the end of three weeks' time; he was positive the girl did not care very much for him, yet, in spite of this, he would get up at 5.30 in the morning to watch her leave home, and stealthily accompany her to her work, lest " she might do something to herself."

During this time and for many months afterwards he suffered from distressing insomnia and impaired appetite. He was always given to excessive blushing, especially in the presence of females. Up to the age of eighteen he always seemed to be afraid, when arguing with anybody, that he might say the wrong thing and offend the person spoken to; in his attempts to correct himself at times he imagined he was making himself appear stupid. It will be readily inferred that the patient's mental state just indicated was in great measure expressive of a dominating self-conscious and introspective nature, to which, indeed, the patient readily confessed.

Between the ages of twenty and forty he wrought in ——; his occupation —that of setting up wheels and constantly supplying orders—involved much harassing worry, excitement, and sweated pay. These conditions of existence, coupled with the responsibilities of married life, naturally did not conduce to make him less of a potential neurasthenic.

His self-consciousness was for ever finding expression in an excessive shyness when in company, a marked tendency to introspection, with the resulting going and coming of phobias of various kinds. A raging epidemic would obsess his mind with the fear that he was sure to become a prey to the infection, or he must be the victim of intestinal tapeworm because a friend who had that trouble presented some symptoms not unlike his own. One phobia left him only to give place to another. Up till about a year before he consulted me, he was able, in spite of the mental strain it caused him, to pursue his employment and to mix with people, but then a period of excessive emotionalism supervened which determined an acute attack of neurasthenia, so that six months later he had to cease work. The symptoms of his attacks were: excessive emotionalism, over-selfconsciousness, restlessness, excessive blushing, anthrophobia, fibrillary muscular twitchings, insomnia and momentary trance, and many of the neurasthenic vaso-motor phenomena. Sometimes, too, he experienced tachycardia in a mild degree. Further, he often talked of committing suicide.

For his attack he consulted several medical men, who prescribed " bromide " and nerve tonics, and advised him to make a prolonged stay in the country, which he did, but without the slightest avail. It was with the greatest of difficulty he was persuaded to consult me, both owing to the intense emotional excitement which that involved, and his belief in the hopelessness of relief or recovery.

He faithfully submitted himself to electrotherapy and other measures which I enjoined. He experienced great mental agitation when put on the couch for the first time, but on leaving my house thereafter he felt his nerves " were infinitely steadier than before the application." After three applications he was able to come to me unaccompanied. In less than three months' time, he had made sufficient progress to enable him to resume work. Six months after leaving off treatment, he wrote me a grateful letter indicating that his recovery had been such that he was engaged all day with loaded rifle in hand, in guarding waterworks against contamination from spies.

Inasmuch as high-frequency treatment is regarded by many members of the medical profession as quackery or ineffectual and, therefore, with contempt in the treatment of disease, one may here affirm the acknowledged and proved physiological effects of high-frequency currents, and thereafter attempt to formulate their mode of action in neurasthenia.

The recognized effects of local high-frequency treatment, previously referred to, many of which are readily apparent to anyone who works with these currents, are:—

(1) a varying degree of hyperæmia of the treated part with resulting tonic effect on the blood vessel walls; (2) vacuolization of the skin, noted microscopically, possibly resulting from liberation of oxygen or ozone from the tissues; (3) increased activity of the sebaceous glands; (4) diminished electrical excitability of the muscles and nerves to faradism and galvanism, although the high-frequency currents can be tolerated in greater strength than before electrification; (5) the production on the surface of ozone and, doubtless, the absorption of this into the tissues, thus increasing the oxidation processes in the blood and other tissues, so that nitrogenous substances are more readily and completely oxidized and excreted as urea, instead of remaining in the tissues unoxidized or incompletely oxidized, and possibly exerting an irritant and toxic action upon the nervous system; for some time after the application of these currents, an odour can be smelt on the patient's skin and clothing, as well as in the atmosphere of the room in which the apparatus is used; this odour is partly due to ozone and partly to the simultaneous production of nitrous acid; (6) a material rise in the blood-pressure, easily demonstrable by the use of the sphygmomanometer before and after an application, in cases in which there is arterial hypotension.

The general applications of high-frequency currents produce a beneficial and toning influence on the sympathetic and vaso-motor system of nerves, thereby causing increase in the oxidation processes in the blood and other tissues, in the reduction of oxyhæmoglobin in the blood, in the elimination of waste products in the urine, in the elimination of carbon dioxide from the lungs, and in the blood-pressure in cases with hypotension, together with mitigation of the various vague neurasthenic pains.

In other words, we get an increased and better regulated metabolism, which also accounts for the increase of the surface temperature and the temperature of the mouth, from a half to one degree F., recorded by Somerville.[1] Some observers record a lowering of the blood-pressure as a result of high-frequency action in neurasthenia and other diseases, besides in cases of hypertension.[2] These apparently paradoxical physiological effects may be explained either by the differences in the apparatus used, or by the regulating (tonic) influence which high-frequency currents undoubtedly exert on the vaso-motor mechanism.

It seems, therefore, in the light of these recognizable effects of high-frequency applications, that the improvement, undoubtedly resulting from treating cases of neurasthenia with them, rests upon definite physiological, chemical, and perhaps physical influences; but there are those who would ascribe these effects entirely to the influence of the patient's own unconscious auto-suggestion. I do not share such a view, because of several personal observations.

Firstly, when beginning the electrical treatment, if the current during an application or two is not allowed to pass to the couch, no improvement in the patient's condition will result; that is, with no current passing to the patient, without his being aware of it, and the whole electrical display influencing his mind suggestively, the symptoms of neurasthenia do not abate. That, perhaps, is the strongest proof that high-frequency currents do not intrinsically act as suggestive influences.

Secondly, high-frequency currents produce their sedative and ameliorating effects with wonderful rapidity as compared with spinal galvanism, no matter how much the administration of the galvanism may be associated with the simultaneous display and working of elaborate electrical apparatus (high-frequency, for example), the patient being under the impression that he is getting the currents from the latter apparatus.

Thirdly, as previously indicated, I have often been struck with the remarkably rapid ameliorating effects of these currents in neurasthenia, more especially in the cardiac variety, the most obstinate " functional " (neurasthenic) tachycardia being ameliorated or cured by them. After the very first application patients, who very often have submitted themselves to the treatment sceptical of its good effects, and more often than not terrified of it, are astounded themselves that on leaving the doctor's premises, they are not so fatigued as usual, and that the heart refuses to act with its wonted rapidity and violence.

One is fully justified, therefore, in inferring from *primâ facie* consideration of these three observations, that the currents have a distinct action on the cause producing the nervous asthenia in neurasthenia. D'Arsonval's view, that the currents exercise an inhibitory influence upon the nervous system, seems to me to be correct, and, I believe, they act essentially upon the vaso-motor and sympathetic mechanisms. For we have the clinical fact that the accelerated rate and increased force of the heart-beats are decidedly diminished by the currents in cardiac neurasthenia, thus pointing to a pronounced inhibition of the augmentor and accelerator fibres of the sympathetic nerves of the heart, with which the vaso-motor fibres are intimately associated.

The increase in the arterial pressure, noted in neurasthenics with hypotension, indicates an excitation of the vaso-motor centres in the bulb, spinal cord, and elsewhere, causing an increased contraction of the peripheral arterioles. I am inclined to the view that this sedative and regulating effect upon the nervous system is due to:—(1) increased oxidation processes, facilitating the excretion from the system of fatigue and other toxins, which have a deleterious action upon the neuro-muscular mechanism; (2) a direct action on the vaso-motor and sympathetic centres in the bulb, spinal cord, and elsewhere, resulting from afferent impulses to them along sensory nerves; (3) a direct influence on the vaso-motor nerves in the peripheral circulation; and (4) a distinct somnifacient effect.

Once the high-frequency currents have brought about some improvement, auto-suggestive influences are set agoing, which produce a circulus virtuosus of psychic events with progressive improvement in the patient's condition, thus explaining adequately why the sedative action of the currents upon the nervous system tends to be permanent and curative.

(b) *Psychotherapy.*

At the very first interview the physician must impress the patient that he thoroughly understands the disease from which he is suffering by dwelling upon and explaining the symptomatology of neurasthenia, and narrating, perhaps, in some detail, cases similar to his own. He must assert then, and at every subsequent interview, his firm conviction, based upon experience of exactly similar cases, that recovery, though perhaps slow, is most likely to result, inasmuch as the disease is purely functional and not dependent upon organic mischief. The physician must at all times exhibit a ready willingness to listen to his patient's recital of his woes, and extend to him his whole-hearted sympathy. Further, he must spend some little time with his patient at each interview in order to exert his " suggestive " influences. In that way the physician will win the patient's confidence, and, when interviewed, his presence will be a source of encouragement and hope to the sufferer. Beyond such suggestion in the waking state, I believe it is unnecessary to go, inasmuch as the simultaneous application of electrotherapy, and the other measures hereafter described, rarely fail to ameliorate or cure.

I have no practical intimacy with hypnotic suggestion, which some observers have vaunted so much as a remedial measure in this disease, though I have attempted and failed to induce hypnosis in a number of cases. Savill[3] states that in his experience " relatively few neurasthenics are hypnotisable." Personally, I am convinced that very few neurasthenics, more especially cardiac neurasthenics, would even dare submit themselves to an hypnotic *séance*. Moreover, inasmuch as the patient's aches, palpitation, fatigue, etc., are real and not hypochondriacal or hysterical in nature, it appears to me to be unwise and, perhaps, dangerous therapeutics to induce in the neurasthenic a condition of hypnosis—an unnatural, and to that extent at least a pathological state—in order to rid the patient of positive facts, actualities, by the inculcation of negative hallucinations.

In the method of treatment of this disease which I adopt, psychotherapy, though a useful, is not an all-important, measure; hence, I never recommend recourse to such measures as hypnotization. I do not minimize, however, the important part which unconscious auto-suggestion of the patient can play in helping towards a *restitutio ad integrum ;* but this is only set agoing once the disturbed emotional, vaso-motor and sympathetic mechanisms have been influenced beneficially by the exhibition of electrotherapy, and the other measures about to be indicated. Psychotherapy, in the form of suggestion by the physician in the waking state, is a useful auxiliary remedial agent, in that it is likely to initiate unconscious auto-suggestion in the patient, and by that means help towards a restitution to the normal state of mind. I agree with Hartenberg[4] and others that psychotherapy is not to be regarded as a specific, that is, will seldom by itself cure or decidedly and permanently relieve true neurasthenia, and that those who claim this for it, have either been dealing with false neurasthenia or simultaneously submitting their patients to other therapeutic measures as well.

(c) *Home Isolation.*

In the Weir-Mitchell method, isolation of the patient is carried out in a nursing home. My experience is that true neurasthenics, particularly when they have reached what we might call the phobia stage, will, as a rule, become worse if they are isolated from friends in strange surroundings. They require that overwhelming amount of sympathy which relatives alone can give them, whilst their emotional upheavals and irritable natures will meet with more tolerance and consolation from friends than from strangers. Moreover, an intense *heimweh* is invariably exhibited by all neurasthenics. By home isolation, I mean complete segregation of the patient in a room in his own home. The room should be the cheeriest one in the house and well-ventilated; no one but the relatives nearest and dearest to the patient should have access to him. The patient is allowed complete freedom of action in his room; he is permitted to go to the lavatory, and can lie down to repose, or sit at the window or elsewhere *sua cuique voluptas.* His actual stay in the room is interrupted only by his visits to the physician for electrical treatment and psychotherapy.

Thus the isolation of the patient is by no means absolute, and this, indeed, is advantageous and desirable, for our object in alienating him from the society of everyday life is to enable him again to tolerate it with that mental unimpressionability characteristic of the normal mind. Soon under the influence of electrotherapy, and other measures about to be detailed, the patient gradually regains his lost self-confidence and his ability to follow his wonted habits and pursuits. I usually encourage the patient to perform gentle exercises, which must stop short of the limit of actual fatigue, in his room, with or without Indian clubs or dumb-bells. This serves the double function of stimulating metabolism and keeping his mind more or less occupied and away from himself; it takes the place of massage in the Weir-Mitchell treatment. Further, I do not prohibit (as is usual) but, indeed, encourage, the occasional reading of light and amusing literature, in order still more to engage the patient's mind, but the perusal of newspapers and exciting or brain-taxing books should be strictly interdicted. The writing of letters, business or otherwise, should be reduced to the barest minimum or entirely forbidden, according to the severity of the neurasthenia.

REFERENCES.

[1] *Glasgow Medical Journal*, 1904, and *Medical Electrology and Radiology*, May, 1906.

[2] Deherm and Laquerriere: *Arch. d'Electricité Med.*, July 10, 1907.

[3] Savill, T. D.: *Lectures on Neurasthenia*, p. 196, 1908.

[4] Hartenberg: *Treatment of Neurasthenia*, translated by Playfair, p. 150, London, 1914.

(*To be continued.*)

IONIC MEDICATION IN MIDDLE EAR CATARRH.

By ARTHUR A. PIM, F.R.C.S.E.

Beaminster, Dorset.

THERE is probably no disease, which in the early stages is so neglected, and, in the later, has been so little amenable to treatment, as middle ear catarrh.

The little cloud, no bigger than a man's hand, is treated with contempt by the patient, and too often in a perfunctory manner by the surgeon.

The history of these cases is nearly always the same: a cold causes slight deafness, which passes off in a few days, but with every succeeding cold the period of deafness increases; whilst it is only when the loss of hearing has persisted for some months, that the advice of a surgeon is sought. If the nasal and post-nasal conditions are then dealt with, all may be well, but in too many cases a habit has been acquired, and the middle ear has become so susceptible to catarrh, that the progress of the case is downward.

Many cases of deafness, which give a negative Rinné with a positive Weber, and at first sight appear to be only due to acute middle ear catarrh, if seen in the summer when the catarrh is better, will show a positive Rinné and a negative Weber, with loss of perception of the upper tones, and a definite loss of hearing, showing involvement of the labyrinth. In a considerable proportion of cases of recurring acute catarrh, the labyrinth is early affected, and each attack of catarrh adds to the serious character of the internal ear affection.

In others, when treatment has come too late, the labyrinth escapes, but the condition of chronic catarrh gradually supervenes with paracusis Willisii. We are told in text-books that medicaments introduced into the middle ear with the Eustachian catheter give good results, but in how enormous a proportion we find it useless, or at best the improvement is fugitive. When we consider the anatomy of the middle ear, the situation of the attic, and the effect that even a slight thickening of the structures surrounding that portion of the middle ear produces, we can easily appreciate how unlikely it is that drugs, applied through the Eustachian tube, can have much chance of reaching the most important membranes involved.

In Ionic medication we have, I believe, a means of dealing with middle ear catarrh, and one which at last offers hope to the patient, and satisfaction to the surgeon. By it we can apply drugs to the seat of the disease, and the drum head being so thin, it offers slight resistance to the ions. Moreover, the penetration is just at that part where the affected structures lie. The great objection is the pain caused by the current, and I do not find that a previous application of cocaine by ionization is advisable, owing to the local reaction after that drug.

After experiments, I have come to the conclusion that much of the difficulty lies in the electrode. An electrode which is applied only to the drum head, will give pain of such an intense character that it cannot be borne. Cotton wool soaked in zinc iodide solution with an aluminium wire attached, applied in the same place, or filling the external meatus with the solution with a wire in the solution, are both, I found, unsatisfactory, and the method I have now adopted, with excellent results, is simple and almost painless.

The patient is placed with the head resting on a table, and the affected ear uppermost. The external meatus and cavity of the auricle are filled with a solution of zinc iodide, a pad of cotton wool soaked in the solution is placed in the auricle, and over all a soaked lint and aluminium gauze electrode, 2½ inches square. The hands are then placed in an indifferent electrode of salt and water, and the current turned slowly on, when it will be found, in this way, that a current of three to four m.a. can be borne comfortably.

The application is for 15 to 20 minutes, but great care must be taken in raising the strength of the current, and a rheostat is advisable. The only sensation is a very slight pricking pain in the ear.

The number of applications will, naturally, depend on the results, but an interval of a week should be allowed between each.

The improvement, as noted by the tuning fork, is rapid, and there is little tendency to recurrence.

The treatment is in its infancy, and at present experimental, but I feel certain that, in Ionic medication, we have found a remedy for a disease which has, so far, baffled the surgeon, and a method of relieving unnumbered sufferers, whose disability is ever present to themselves, though too seldom considered by their neighbours.

◆

THE NON-SURGICAL TREATMENT OF GRAVES'S DISEASE — A COUNTER-BLAST.

By THOMAS BODLEY SCOTT, M.R.C.S. L.R.C.P.

Bournemouth.

THE nomenclature of a disease by the name of its first describer has its advantages; it is, naturally, a compliment from Science to the man, but it also serves to concentrate attention on the disease, or the group of symptoms we call the disease, in such a manner that they can never be forgotten and seldom missed. Graves's disease is a title that it is well to maintain, I think, for its more modern title "Exophthalmic Goitre" is not always a correct definition; there may be no goitre and no exophthalmos. The concentration of thought on a disease is good, but if it passes on to a crystallization of ideas, it is bad. In this disease, perhaps more than in others, the prominent symptoms are, in most cases, so striking that the unscientific mind sees the picture only, the morbid surface, and contentedly sees no more. In reality this syndrome displays a wonderful example of deep-seated, widely distributed, functional disturbance, ending in organic structural disease. The cause is not in the thyroid nor in the eye. When one studies the early history and the premonitory signs of our cases, one is inevitably led back to the nervous system, and especially to the sympathetic branch of that system.

The cardinal symptoms may be said to be thyroid enlargement, exophthalmos, tachycardia, and nervous tremor; but the first two may be absent, while the last two are always present. This fact points almost conclusively to the nervous system as the first visibly disordered link in the morbid chain; I say, visibly, for we must go still deeper and seek for the *causa causans*. In some cases, especially perhaps, in women, there is a clear account of nervous shock, of grief, or of great anxiety, sufficient, perhaps, to be called a cause, but, in others, the oncoming is insidious, and there is a period when there is, as yet, no thyroid enlargement, and only occasional tachycardia and tremor; even in the shock cases, careful inquiry will often reveal pre-existing disorder.

I cannot, for my purpose, do better than quote Major McCarrison's exhaustive description. He says:

> "The ætiological factors which favour the onset of Graves's disease are those which we have seen determine all departures of the thyro-parathyroid glands from the normal state; these are nutritional, psychic, and infectious.
>
> "Briefly recapitulated, these factors are: (1) insufficient food or over-indulgence in food, and the disorders of nutrition to which these and chronic debilitating diseases give rise. Amongst the most important of such diseases are chronic constipation, intestinal disorders generally, and chiefly intestinal

stasis. (2) Fright, mental distress and worry, business or social cares, unfortunate love affairs, violent emotion, and mental and physical exhaustion, with loss of sleep, such as occurs amongst soldiers in the trenches. (3) Attacks of acute infectious diseases, notably influenza, tonsillitis, rheumatic fever, typhoid fever, tuberculosis, secondary or hereditary syphilis; naso-pharyngeal and uro-genetal disorders, pyorrhœa alveolaris and helminthiasis.

" As in myxœdema, so in Graves's disease, the onset of a proportion of cases may be precipitated by some accidental circumstance, such as a train disaster, a fall from a horse, or by the excitement and strain of war.

" The ideal conditions for the development of the disease are provided when all three classes of factors—nutritional, psychic, and infectious—operate on the individual at the same time, or where two of them do so. They are predisposing causes only, which favour the action of the underlying causal agency.

" This agency is one which gives rise to continuous excitation of the sympathetic nervous system. That symptoms similar to those of exophthalmic goitre can be induced by the continuous excitation of this system is shown by the experiment of Cannon, where the phrenic nerve was joined to the peripheral portion of the cut cervical sympathetic in the cat (Cannon, W. B., *Boston Med. Journal*, 1916, CLXXV. 16, p. 564). The operation resulted in tachycardia, increased excitability, loose motions, exophthalmos, on the operated side, and in increase of the body, metabolism as well as in an increase in the size of the adrenals. In seeking for the source of the excitant of these symptoms in Graves's disease, one is reminded that effects similar to those caused by stimulation of the sympathetic nervous system are produced by certain amines, resulting from the putrefactive decomposition of proteins or amino-acids in consequence of bacteria action (Barger, G., *The Simpler Natural Bases*, London, 190—). The most common source of these amines is the gastro-intestinal tract.

" The extraordinary influence of gastro-intestinal toxæmia in the genesis of Graves's disease is exemplified by a case recently admitted under the care of Sir Arbuthnot Lane at Guy's Hospital :—

> " The subject was a girl of 19½ years of age, who developed, in South Africa, Graves's disease of very severe type. The condition was of some eighteen months' standing. She had a marked rheumatic history, having had chorea at the age of seven years, tonsillitis, rheumatic fever and chorea at nine years, and ' nervous debility ' for six months at thirteen years. She had suffered from palpitation from the age of eleven. On admission to hospital she presented the following symptoms : great emaciation, dull abdominal pain, recurring attacks of nausea and vomiting, goitre of small size, prominent exophthalmos, tachycardia, severe palpitation and a heart's action so violent as to shake the bed, great pulsation of the carotids, abdominal and iliac arteries, great muscular weakness, pronounced tremor with a tendency to drop things, great nervousness, dizziness, severe headache, flushings, subjective sensations of heat, suppressed menses, loss of and greying of the hair, voracious appetite, and albumen and sugar in the urine; in short, a case so typical and so severe as to leave no room for doubt as to its nature.
>
> " Röntgen-ray examination by Dr. Jordan revealed the presence of a greatly dilated stomach with pyloric spasm, an elongated duodenum, and a state of chronic irritation of the colon resulting in unduly rapid emptying of the contents.
>
> " Sir Arbuthnot Lane performed gastro-jejunostomy and removed

> an anchored appendix, which exerted a most marked control upon the ileal effluent, and freed a very tight terminal kink at the junction of the iliac and pelvic colon. The operation was performed on January 21, 1916, and was followed by two weeks' considerable pyrexia. At this time the patient's weight was only 4 st. 10 lbs., but, following the return of the temperature to normal, she began to put on weight and to improve in the most remarkable way. Seen on October 20, 1916, her weight had increased to 8 st. 5 lbs., the exophthalmos had totally disappeared, the palpitation was completely gone, and the tachycardia was greatly lessened, menstruation had returned, the muscular weakness, headache, vomiting and all other symptoms, with the exception of the small goitre, had disappeared. The goitre was but little altered in size, and persisted, doubtless, owing to fibrotic changes. The patient felt and looked a different being, and could walk for a considerable distance without fatigue, while the greyness of the hair had disappeared and its scantiness was replaced by luxuriant growth.

" Here, then, is a case of surpassing interest, in which the symptoms of Graves's disease are definitely shown to have resulted from alimentary toxæmia."

Skilled X-ray examination of the abdomen may often discover a removable cause of septic absorption.

McCarrison says, further on: " The thyroid gland has for so many years played the star part in the drama of Graves's disease, that too little attention has been paid to less prominent performers, and its author's identity has, for this reason, been to a great extent obscured."

From the general practitioner's point of view, which is also mine, in all these academic descriptions of disease, there is something lacking. It is, no doubt, interesting, and to a certain extent satisfactory, to find a diagnosis confirmed in the post-mortem room, but nevertheless, that room remains the grave of our hopes, the mausoleum of our failures. In the words of the *Biglow Papers*—

" Sermon through and come to do
Why there's the old J.B.
A crowdin' you and me."

John Bull and his daughters have in their blind, rather selfish way, no altruistic ambitions to become pathological specimens; they want to be cured, and it is we general practitioners that have to do it. Ætiology, morbid anatomy, family histories, and predisposing causes are all very valuable in their way, but the study of disease is too apt to end here; they are all useless, unless they are made the sure and stable foundations for building thereon the temple of health.

Graves's disease in a hospital ward is a very interesting study, but in domestic life it is almost a tragedy; the nervous restlessness, irritability, and unreasoning temper become a scourge both to the patient and to the family. One cannot help feeling that up to recent times the treatment of this disease has been almost a failure. About half the number recovered more or less spontaneously, more or less completely, and the other half went down the hill and died.

The greatly increased metabolism leads to emaciation, and the tachycardia leads to heart exhaustion, dilatation, and valvular insufficiency. The treatment, to-day, with our new and rapidly increasing knowledge of the endocrine glands is much more hopeful and already more successful. Briefly, not wishing to be dogmatic but only suggestive, this, I think, should be the scheme. First, rest, as complete as circumstances and the temperament of the patient will allow —it will never be more than partial; secondly, find out by all the means in our power the initial error, the source of microbic infection, if such there be, intestinal, uterine, oral, nasal, then medically or surgically treat them as they need, and finally treat the resulting symptoms by our modern glandular extracts.

In practice, all these methods will have to be carried out together. The first error to be attacked in the majority of cases will be in the digestive tract; frequently there will be found gastric or intestinal dyspepsia, and the intestinal is the more important; signs of colitis are often present. These faults are best attacked by intestinal antiseptics, such as beta-naphthol and salicylate of bismuth. Izal perles are a good and convenient remedy. In addition to these duodenal extract is a great help.

This formula I have found work well :—

Duodenal extract -	grs. 2
Ext. Cannabis Ind. - - - -	grs. $\frac{1}{6}$.

In tablets; one, three times a day, an hour after food.

This acts often like a charm on duodenal catarrh and on colitis that has not gone too far. Carnrick's new Kinazyme acts very favourably in the same way. Constipation can generally be avoided by giving paraffin daily. The diet should be simple, not rich, and should not include much meat. Milk better than anything supplies the waste of lime salts.

When we come to the special symptoms of Graves's disease, we must decide whether to attack the cardiac or the nerve symptoms chiefly, though both may be treated to a certain extent together. The original cause acts probably as a disturber of all internal glands, but the three chiefly affected are the suprarenal, the thyroid and the para-thyroid. The suprarenal is supposed to be over-stimulated by the excess of thyrine poured into the blood, which is known to be a hormone to that organ, but it may well be affected primarily by the same poison. In most cases, then, we get evidence of thyroid and suprarenal excess. The exophthalmos is due to excessive action of the suprarenals, as has been shown by Maurice of Lyons. The tachycardia is generally the earliest symptom that we can estimate, and is due to irritation of the sympathetic nerves supplying the heart.

McCarrison says, p. 213 :

" It does not appear from evidence at present available that the explanation of the cardiac activity is so superficial or simple as either a thyroid hypersecretion or hyposecretion would indicate, but both the cardiac activity and the thyroid reaction are parallel manifestations consequent on some more general and remote disturbances.

"Not only does the thyroid hyperplasia bear no direct relationship to the pulse-rate, but the excess of a-iodine (thyroid hormone) in the blood stream, which results from it, appears to be only indirectly responsible for the tachycardia. Experiment has shown that after the administration of this substance there is no apparent effect for many hours. There is no increased pulse-rate or drop in the blood-pressure. If, however, amino-acids are injected simultaneously the pulse-rate is enormously increased (Kendal, E. C., *Boston M. & S. Journal*, 1916). These findings appear to me to provide a further clue to the nature of the substances responsible for the heightened cardiac action in Graves's disease. They are, I believe, the poisonous decomposition products of amino-acids—monamines and diamines—which may be formed in the organism wherever proteins or amino-acids are exposed to the action of bacteria—and especially to the action of anærobic bacteria in the gastro-intestinal tract (Barger, G., *The Simpler Natural Bases*, London, 1914). These highly virulent poisons may not only initiate the histological changes in the thyroid gland but, by their direct action on the adrenal-sympathetic system or by their chemical inter-action with the gland's secretion and the disturbance of its normal balance, they may give rise at the same time to the tachycardia."

Man is much more susceptible to large doses of thyroid than animals, but although some of the symptoms of Graves's disease are produced by these doses the whole picture or syndrome is far from complete. We must, I think, conclude that hypersecretion of the thyroid is only one of the causes of the cardiac affection.

There arises now the question: How much is the parathyroid involved? The nerve tremors point to parathyroid deficiency. Does the cause that stimulates the suprarenal and the thyroid depress parathyroid action? Or is the balance of power so disturbed that the excess of thyrine overwhelms the parathyroid? I think the latter is probably the case. The nervous symptoms point, as I have said, to parathyroid deficiency, but this may be only relative; the natural antagonism between the two glands is always present, but the hyperthyroidism wins the day. It will be found, I think, that parathyroid treatment by the mouth controls and helps much to cure the tremors and other nerve troubles of this disease. I have seen this case lately:—

A lady, 32 years of age, had had colitis and leucorrhea for some time, and latterly an ulcerated condition of tongue and mouth; she had lost flesh, and become very weak and short of breath. She had tachycardia, varying in intensity, and characteristic tremors of the hands. The thyroid was slightly enlarged and pulsating, no exophthalmos; the stethoscope revealed a slight systolic murmur over the gland. She was given Izal perles and parathyroid (dried) in ¼-grain doses three times a day.

This is a typical case of early Graves's disease with the common intestinal causation. Four weeks of this treatment has removed all the symptoms, with the exception of the colitis, which is not quite cured.

Another type of case, the most acute I have ever seen, has been published in THE PRACTITIONER, but will, I think, bear repeating.

It was reported by Dr. Norman of Broadstone.

A young woman miscarried at four months on May 3, 1915, no abnormal hæmorrhage. At the time she complained of such intense headache that all other pains were masked.

May 6.—Slight dyspnœa; temp. 100. Has not slept since her illness began; headache still very bad, pulse 110.

May 14.—I saw the case with Dr. Norman. Pulse 130. Systolic pressure 100 m.m., with large pulsating thyroid, heart dilated, great dyspnœa, tremor of hands, but no exophthalmos. She was quite unable to lie down and looked as if she had only a day or two to live. Diagnosis, acute Graves's disease. That night she slept after scopolamine and morphia. Parathyroid, ¼-grain doses, was given frequently, and in four days all symptoms rapidly abated. On the 25th—11 days after parathyroid was begun—she was able to be about, the thyroid enlargement had almost disappeared, and she has continued quite well since, more than a year having elapsed. In this case, there was no evident sepsis in the mother, and the cause was possibly in the dead fœtus.

The only exogenous drug that seems to me to be of use is strophanthus; this may be given in large doses when the heart is much dilated.

My contention is that we have in this disease a pluriglandular disturbance, not only as to quantity of secretion, but as to quality also, and that this disturbance is in the great majority of cases caused by bacterial poisons from within. Shock, grief, and fright are, I think, only emergencies stirring up partly latent trouble. These glandular disturbances act partly by direct action on certain organs, such as the heart and sympathetic, but chiefly, perhaps, by producing discord in the glandular system of the whole body. The newer physiology has given us a glimpse of the wonderful perfection and delicacy of that vital machinery; surely, then, it should point the way to a return from these jangling discords to the old harmonies of health. The two cases I have quoted were brought under treatment in the early stage; mostly, we have not the chance of seeing them till the symptoms have been going on for some time, and when secondary damage has been done. We have then to call other glands to our aid. Thyroid, we know, in the active onset of the disease, does harm and increases the tachycardia.

For many years, the action of suprarenal in this disease has been advocated. Some physicians, like the late Lauder Brunton, have succeeded with it, while others have failed. I think the error has arisen in the choice of cases, though in most it is of some help.

Schäfer says on this point, referring to the sympathetic excitability seen in this disease, " Here the question arises, Is this a direct effect on the sympathetic system? Or is it indirect through the adrenals, which are stimulated to increased activity by the excess of thyrine in the blood? The answer is not easy; but it may be stated that although certain symptoms of hyperthyroidism are similar to those produced by excess of adrenine in the blood, others are not so —this is the case with flushing of the skin, which is due to vascular dilation, whereas adrenine ordinarily produces vaso-contraction; moreover, it is undoubtedly the case that the administration of adrenine exercises a markedly beneficial effect in some cases of the disease —a fact which would be inexplicable on the theory that the results of hyperthyroidism are simply due to excitation of the suprarenals and to the production of an excess of adrenine."

Systematic observation of the blood-pressure shows daily and hourly variations; mostly it is slightly raised, but it is often much below the normal (Dr. Norman's case).

The sphygmomanometer should be our guide to the use and dosage of suprarenal extract; the flushed, hyperæmic, perspiring skin would point also to its beneficial use.

In nearly all cases we have in the circulation a plus condition of thyrine and probably a perverted condition as well; we have also a plus condition of adrenine. May not this be an effort of Nature, not only to balance the depressor effect of thyrine but to correct its quality also? The cases which show an habitual low blood-pressure are more severe and more likely to develop the later serious cardiac symptoms. It may be these cases that benefit so much from suprarenal treatment. The combination in these cases of suprarenal and parathyroid treatment is very effectual.

In acute febrile diseases, as pneumonia and diphtheria, when the blood-pressure falls very low, suprarenal will soon raise the pressure to the patient's great advantage. Pituitrin and thymus have been used, but there is no great weight of testimony in their favour. There remains, however, pitglandin, the extract of the pars anterior. A year ago, Dr. Robertson and his colleagues in the Californian University succeeded in isolating from this part a chemical substance, which they have called tethelin. There is, as far as we can see, nothing toxic in this extract, which is now called pitglandin, and, indeed, large doses are required to produce results.

The critic will say, perhaps, "Is not this new therapeusis as speculative as its physiology? If it is, where is the danger?" We are not dealing with dangerous, exogenous poisons. How many of our successful remedies have come from pure empiricism? Here we are, doubtless, empirics, but working on physiological lines. The investigation and discoveries of endocrinology point in Graves's disease to a pluriglandular disturbance, and it must be met and conquered by pluriglandular aids.

Biedl, after all his years of patient, brilliant work, sums up this subject in this impotent manner:—

> "The results of organotherapy in Graves's disease are interesting only in so far as they furnish direct evidence against the assumption of a hypothyroidism in this condition. The effect produced by thyroid extract is universally the exaggeration of the disease. Attempts to treat Graves's disease with extracts of thymus, ovary and suprarenal have a certain theoretic interest, but are of no practical significance."

This is a typical example of the limitations of the scientific mind. He brings one within sight of the promised land, and then throws doubts on its very existence.

It is only exceptional minds, like Lord Kelvin's and Lauder

Brunton's, that can translate their deep knowledge into beneficial action. On the other side, Rudinger says (to go back to parathyroid) :

> " We have to suppose that, under normal conditions, the function of the one gland (thyroid and parathyroid) is controlled by the other, and that when the balance is disturbed by the extirpation of one, the remaining organ becomes functionally and later organically hypertrophied."

He brings the following as evidence in support :—

> " Moussa and Chanin found that the exhibition of the parathyroid gland of horses was followed by unfavourable symptoms in myxœdema, but that in Graves's disease it had a very beneficial effect. Rudinger believes that the hyperfunction of the thyroid in Graves's disease is restored by the exhibition of parathyroid, while in myxœdema the hypofunction is intensified. He is also inclined to attribute the favourable action of Mœbius's serum and of rhodagen to the presence of a large proportion of parathyroid secretion.
>
> " The removal of the thyroid permits of an increased activity on the part of the parathyroids ; thus, the serum and the milk contain substances which, being stronger than those in normal serum and milk, are better able to counteract the activity of the thyroid gland. Rudinger, as a result of his investigations with Eppinger and Falta on the action of adrenalin in thyroidectomized animals (with regard to the ensuing glycosuria) infers that the thyroid secretion stimulates the sympathetic nerve ; while that of the parathyroids has an inhibitory effect on it. Stimulation and inhibition are so balanced by the activity of the two glands that, under normal conditions, oscillation is possible within a very small range only.
>
> " The suppression of the thyroid secretion reduces the irritability of the sympathetic nerves, not only by robbing it of its stimulating agent, but by releasing the inhibitory effects of the parathyroid. With the extirpation of the parathyroids the inhibitory agent is removed, and this brings in its train a condition of hyper-sensibility of the sympathetic."

In paralysis agitans and tetany, which bear many points of relationship to Graves's disease, there is almost certainly parathyroid deficiency, at any rate, they are much benefited by parathyroid feeding. Schäfer, on this point, says, " The most satisfactory explanation of the nervous results of the removal of the parathyroids is the assumption that they yield to the blood a special autacoid—presumably of a chalonic or restraining nature—which tends to prevent over-excitation of nerve cells. This hypothetical autacoid—which has not yet been isolated—may provisionally be termed parathyrine. We shall see that there is reason to believe that the thyroid produces an autacoid with an opposite tendency."

Halpenny and Thompson, as a result of observations on dogs after parathyroidectomy, see good reason to believe that the parathyroid exercises an inhibitory influence upon the thyroid itself, as well as on the sympathetic system.

In the clinical study of all diseases of the thyroid apparatus, we see complications arising that are more or less absent in the laboratory. It is rare, I think, to get disease of the thyroid or parathyroids pure and simple ; that is to say, without the involvement of the other to some extent. This makes the treatment of either Graves's disease or myxœdema a more subtle but more interesting study.

When one reads Kocher's well-known list of symptoms of the two diseases in parallel columns, one's first thought is, that never were two diseases with such a complete contrast, but his description of the symptoms is at the acme of their activity, and the later study of individual cases will often show a slow merging of one into the other or at any rate of Graves's into myxœdema. Hyperfunction, if long continued, must lead to hypertrophy and ultimately to atrophy. We see this hypofunction ending in a form of myxœdema at the end of a fair number of cases of Graves's disease. This fact should make us pause and very carefully consider before we sanction the operation of thyroidectomy. The complete removal of the gland is, as we know, disastrous, and in the partial removal, which has often shown at first brillant results, we know little of the after-history.

How do such cases fare in real old age, when we want all the thyroid we can get, and most of us a bit more?

With a noisy turbulent crowd in a music hall, the chucker-out is a necessary bit of brutality, but all our endocrine glands, even when quarrelsome, are essential to our well-being, and so the chucker-out in the form of the surgeon, should be the last court of appeal. There are some cases that have become so severe that his help is necessary, but his appearance on the stage is a great reflection on our therapeutic weapons and skill.

Wendell Holmes has somewhat sarcastically called the profession of undertaker the post-medical profession. In Graves's disease, we should not allow the surgeon to earn and assume this honourable title. That brilliant craftsman, the thyroidectomist, should become an anachronism, a tradition only of the dark days that are gone; and medicine, strong in physiological and philosophical faith, should resume her peaceful sway. Midway between medicine and surgery comes the X-ray treatment. This method has been so improved of late by the combination of the sinusoidal current with X-rays, that experts feel fairly confident that they can avoid permanent injury to the gland (*see* Dr. Hernaman Johnson's wise and temperate letter in the *Lancet* of December 29, 1917), but one cannot help feeling that, in any but the most skilled hands, there must be some risk of injury which may only show itself in the far future.

The treatment by the combination of judicious X-rays with the internal gland holds out, I feel sure, a most hopeful prospect. In medicine, then, we must be boldly radical, but in surgery wisely conservative, for

> "The mill will never grind again
> With the water that has passed."

PETROL DERMATITIS.

By Surgeon G. B. PAGE, M.B., R.N.

(*Published by permission of the Medical Director-General of the Navy.*)

So far as I am aware the condition of petrol dermatitis has not been described before in the medical press, although it must be familiar to many who have been attached to the Air Services. During nearly two years with the Royal Naval Air Service in Flanders, I saw a number of cases, and, as I have been asked on several occasions recently for suggestions regarding treatment, the following notes may prove useful.

The condition is due to the more or less prolonged contact of petrol-soaked clothing with the skin, and is a fairly frequent concomitant of aeroplane crashes. The occupants may be pinned by wreckage beneath a burst tank, and, after being extricated, they may be too dazed or hurt to remove their flying gear so as to allow the petrol to escape. Inexperienced pilots, though otherwise unhurt, may delay changing their clothes, until the burning pain warns them that something is wrong. Less frequently the condition is brought about during an ordinary flight by leaking tanks or connections, and I have seen two cases which were not related to aviation.

The lesion produced resembles exactly a burn or scald of the first and second degree; that is to say, there is erythema and some vesication with a considerable amount of burning pain. The area involved is often large, *e.g.*, both legs, thighs, and feet.

As regards treatment, it is worth while noting that grease of any sort increases the discomfort. Lead lotion applied on lint or zinc-carbolic lotion (zinc oxide, drs. 3, suspended by glycerine, oz. 1, in 1 per cent. carbolic acid solution to oz. 8) sponged on are the best applications at first. These may be followed by a simple dusting powder when the symptoms subside, a process which is fortunately rapid. The affected limbs should be left uncovered in warm weather, or else a cradle used to support the bed-clothes.

As it may be the duty of any practitioner to attend an aeroplane accident, I would emphasize the importance of noting whether the patient's clothing is saturated with petrol, and, if it is, of removing it as soon as circumstances permit.

Perhaps I may be forgiven if I digress so far as to remind readers, unacquainted with aviation, that the débris in an aeroplane crash, together with the surrounding ground, is covered with petrol as a rule, and that it is the duty of those rendering aid to see that naked lights and smoking in the vicinity are forbidden.

It will be seen that petrol dermatitis is a very painful but not a serious condition, and that it may prove a troublesome complication when injuries demanding tranquillity on the part of the patient are present.

A CASE OF ACUTE TUBERCULOUS PERITONITIS IN THE COURSE OF PARATYPHOID FEVER SIMULATING PERFORATION.

By KAMEL YACOUB, Yuzbashi, E.M.C.

M.O. Egyptian Stationary Hospital, Kantara.

The patient, an Egyptian Labour Corps man, aged 20, was admitted to hospital as a transfer from El-Arish Egyptian stationary hospital. He was treated there as a case of relapsing fever, and was given a dose of kharsivan (0·40), there being an epidemic of relapsing fever at that time. On the day following the injection, the temperature came down to normal; but it went up again to its original standard on the evening of the same day. The blood being negative for relapsing fever, a specimen was sent to the laboratory to be examined by Widal's method; and the result was positive for bacillus paratyphosus B. The case was a severe one, but it ran an uneventful course for 25 days, when the temperature came down to normal but was still unsteady.

At the end of the fourth week, the patient suddenly complained of severe abdominal pain and vomited, four times, small quantities of almost pure bile; his bowels had been constipated for the previous 24 hours. When seen, the patient had a very anxious and troubled appearance; his pulse was very weak, and counted 120 per minute, and the temperature was 99°·5. On examination, the abdomen was found to be distended, there was pain and tenderness all over, and dullness with signs of some fluid in the flanks.

The case was suspicious of perforation, although the condition is comparatively rare in paratyphoid, and I thought that operation was advisable; but when the case was reported to Major W. W. Treves, O.C. of the hospital, he was of opinion that, since there was free fluid in the abdomen, the case was too far advanced, and the patient being also very weak, he was left without operation.

On the following day, however, contrary to all expectations, the patient was feeling rather better; and his improved condition allowed a more thorough examination to be made. The abdomen presented the same signs as on the day before, but when the chest was examined, there was evidence of some fluid at the bases of both pleural cavities; by means of an aspirating needle, a little straw-coloured fluid was withdrawn. A diagnosis of tuberculous peritonitis and pleurisy was therefore made, although no tubercle bacilli were found in the aspirated fluid.

The man died 12 days after the appearance of the abdominal symptoms, and a post-mortem was made. On opening the abdomen, a quantity of yellowish fluid, with very slight tendency to turbidity, was found in the pelvis; the intestines were slightly held together with flakes of lymph, and were drawn up a little to the posterior abdominal wall. The mesentery was thickened and infiltrated, and contained a number of large and inflamed glands, a few of which were caseating; the peritoneum was inflamed but not much thickened. Both pleural cavities contained a few ounces of the straw-coloured fluid, but there was no evidence of tuberculosis in the lungs nor of any tubercles in the pleuræ visible to the naked eye.

Cases of chronic tuberculous peritonitis have been confused with typhoid or paratyphoid; but the occurrence of acute tuberculous peritonitis in the course of the fever, and at a time when perforation of the intestine is most liable to occur, is so rare a combination that I venture to record the case.

From the post-mortem appearances, it was evident that the tuberculous affection, at least as far as the mesentery was concerned, was an old one. It is quite conceivable that the inflammatory and toxic phenomena due to the fever lighted up, by hastening the caseation and liquefaction of the glands or otherwise, an attack of acute peritonitis on top of the old and hitherto quiescent affection. On the other hand, the combination may have been a mere coincidence; in any case, the remembrance of such a possibility will save a patient from the risk of a serious and unnecessary operation.

Another interesting feature of this case was the effect of the arsenical compounds in temporarily reducing the temperature to normal. However, during an epidemic of relapsing fever, when salvarsan was used as a routine, and when, owing to the pressure of work, the blood was not examined in every case, exceptional cases were met with in which the temperature temporarily fell to normal after the administration of salvarsan; these cases afterwards proved to be not relapsing fever but typhoid or paratyphoid, and, in one case, bubonic plague.

For the permission to publish this case, I am indebted to the kindness of Lieut.-Colonel G. W. Heron, D.S.O., R.A.M.C., A.D.M.S., Egyptian Hospitals, E.E.F. The bacteriological examination was made by Captain G. Stewart, R.A.M.C., of the Military Laboratory, Kantara.

Practical Notes.

HYDROCHLORIDE OF EMETINE IN THE ACUTE AFFECTIONS OF THE LUNG IN CHILDREN.

Mery has been making use of this drug in acute inflammatory and congestive affections of the lung because of its depleting and antiphlogistic effects. One of his pupils, Million, has just published a thesis, in which he deals at length with this subject, devoting particular attention to the use of the drug in the treatment of broncho-pneumonia accompanying or resulting from measles.

In every attack of broncho-pneumonia there are two factors, one of infection and the other of congestion. Emetine has no effect upon the infectious element, but exerts a considerable influence upon the active congestion due to inflammation. Digitaline, on the other hand, is useful for counteracting the passive congestion produced by circulatory disturbances, due to a failing heart and dilatation of the right ventricle.

In addition to its effect upon congestion, emetine has a favourable action upon the temperature and upon the bronchial secretions. In this respect it possesses a very great advantage over ipecacuanha, because it does not cause vomiting and the depressing effects arising in consequence. It often brings about very quickly a considerable fall in the temperature, which Million considers may be looked upon as being of favourable prognosis in the development of the disease. In very many cases this fall of temperature has been achieved in four or five days, and sometimes in two or three. Defervescence then proceeds satisfactorily, but is occasionally deferred until the sixth day.

In unfavourable cases, the temperature remains high, the pulse quick, the dyspnœa urgent, and all the symptoms are aggravated as the fatal issue gets near.

The pulse and respiration correspond to the course of the temperature. When emetine is acting beneficially, the fall in the temperature is coincident with a notable decrease in the rate of the pulse and the disappearance of cyanosis from the lips. The hurried respirations, from 70 to 80 a minute, shallow and laboured, become easier and deeper. The relief of the congested condition of the lung is shown by the alteration of the fine subcrepitant *râles*, which gradually get less and then disappear. Finally, the complete absence of depressing effects and of vomiting, and its ease in use, even in quite small children, are the great advantages of this drug, which retains the useful properties of ipecacuanha without its drawbacks.

Treatment by hydrochlorate of emetine is carried out by daily hypodermic injections, four or five of which are given, more being needed very seldom. After an interval of six or seven days, if a relapse occurs and the previous effects of the emetine have been satisfactory, four more should be given. The daily dose should be—

Under 1 year - - - - -	¼ to ½ cg.
From 1 to 4 years - - - -	1 cg.
Over 4 years - - - - -	2 cg.

The injections should be given into the outer side of the thigh, and cause neither pain nor any local reaction.

The advantages of the use of this drug in the broncho-pneumonia of children may thus be summed up:—

1. Antipyretic effect sometimes considerable;
2. Expectorant action, making the secretion more fluid;
3. Relieves the congestion, its most important effect;
4. Is not a depressant;
5. Easy to use, even in babies;
6. Therapeutic doses not toxic.

—(*Journ. de Méd. et de Chir. prat.*, November 25, 1917.)

ANTIMALARIAL ACTION OF METHYLENE-BLUE.

Boinet's observations go to confirm the antimalarial effect of methylene-blue, which will relieve severe attacks, given in large doses, even without combination with quinine. It is effective in recent rather than in chronic malaria. It should be given for two days, in a daily dose of 50 cg., as soon as quinine is stopped. This drug still remains the specific for malaria, but its effect is much increased by methylene-blue, which is indicated as well when quinine is of no effect or is not well borne. It can be used to replace quinine in the intermittent periods of secondary malaria, whatever method of treatment may have been adopted. It acts as an excellent adjuvant to quinine, especially when the parasite has actually acquired a resistance to quinine, an effect met with in cases treated by that drug for long periods.

In the treatment of relapses of chronic primary malaria, it is not possible to obtain, in most cases, an immediate sterilization of the organism. In obstinate cases, it is needful to lessen the virulence and the vitality of the hæmatozoa by colouring them by means of the absorption of methylene-blue. This attenuation of organisms coloured by methylene-blue has given Boinet excellent results in the treatment of Malta fever in its early stage A like effect is obtained in malarial diarrhœa in dysenteric enteritis of malarial origin, in cases of association with bacillary or amœbic dysentery, in short, in amœbiasis.—(*Le Progrès Médical*, March 9, 1918.)

THE LOCAL APPLICATION OF ALOES IN THE TREATMENT OF INSECT-BITES.

Professor Pugnat, of Geneva, draws attention to the formerly extensive, but now forgotten, use of aloes as an external application. It was in much favour as a dressing for wounds and sinuses, but in later days it has only been used in veterinary practice. During 1917, Pugnat made several experiments with aloes in the treatment of insect-bites, and obtained such good results that he considers this fact to be of material benefit to all exposed to mosquito bites. He uses a saturated solution in alcohol, rubbing the place well with a small pledget of wool soaked in this, or even with the damp end of the cork of the bottle. No local or general reaction is produced, neither swelling, redness, nor pain, but this happy effect is only obtained if the application is made as soon as the bite is felt. Pugnat himself is particularly sensitive to wasp-stings, and was stung in three places on his right hand, but the application of the tincture of aloes quite prevented the usual effects from appearing. Equally good effects follow its use in stings from bees and other poisonous hymenoptera. He has not found out, as yet, what the neutralizing substance is in aloes, but he is extending his observation to the bites of venomous snakes.—(*Journ. de Méd. et de Chir. prat.*, March 25, 1918.)

Reviews of Books.

Minor Maladies. By LEONARD WILLIAMS, M.D. Pp. xii + 402 Fourth edition. London: Baillière, Tindall and Cox. 7s. 6d. net.

WE have read every word in this essentially practical book. Dr. Leonard Williams has no peer in the medical profession in the art of writing English; and even if he were offering rubbish, he would do it in so interesting a fashion and in so fascinating a style that it would still be worth reading. This book, however, is most emphatically not "rubbish." Almost every sentence breathes a point worth remembering, whilst every page contains advice likely to prove of service to the man in general practice. We strongly advise every practitioner to obtain a copy, read it carefully, and afterwards—read it again. He is bound to benefit as the result.

Radiography and Radio-therapeutics. By ROBERT KNOX, M.D. Part I.—*Radiography.* London: A. and C. Black, Ltd.

IN its second edition this work is being published in two parts, of which the Radiography sections have just come to hand. This subdivision is a novel arrangement, for only a volume of clumsy proportions could possibly do justice to what are, in reality, two different branches of medicine, allied by virtue of the similarity of the apparatus required for their practice. The common practice of tacking a few pages on therapeutics to the end of a work on Radiography is thoroughly vicious, and Dr. Knox is to be congratulated on his decision to devote a separate volume to treatment.

The author apologizes in his prefatory remarks for any shortcomings due to the war. These, if present, need careful looking for. On the material side, the book is a triumph of British technique under abnormal conditions, paper, printing, and, above all, illustrations being of excellent quality.

The first thing which strikes one on opening the book is the beauty of the reproductions. The whole-page plates, when not more than two radiographs are reproduced, are the last word in text-book illustration, and are in all respects equal to actual photographic prints of the same size. So impressed is the reviewer with these pictures, that he cannot help thinking that in the next edition—for which he is sure there will be an early call—Dr. Knox would be wise to depend almost wholly on such plates. Much room is taken up by reproducing small pictures in duplicate, positive and negative. As a matter of fact, although a negative in a proper viewing box is of much greater value than a print, this value is due to its being viewed by transmitted light. Reproduced on paper, it is but a simulacrum, and shows, as a rule, less detail than a bold print. The duplicate method may help the very inexperienced, and a few such illustrations might be useful to begin with. But Dr. Knox, having shown what can be done with the large plate, makes us hungry for more of such, even at the cost of a less varied diet. The work already comes near being a British atlas of Radiography, and this further improvement would make it so in fact.

The first 130 pages of the book are devoted to descriptions of apparatus, and almost every modern form of X-ray producing appliance receives notice. An exception is found in the case of the Caldwell interrupter, which is so excellent a break in high voltage that it is a pity it has escaped mention. All the descriptive matter is clear and concise, understandable by a beginner, and interesting as a refresher of memory to the expert.

The section on the localization of foreign bodies naturally occupies considerable space, and many methods are fully gone into. In the early days of the war a perfect plague of so-called new methods descended on the readers of the medical press, and the question was even discussed in the columns of the *Times ;* one cannot help wishing that Dr. Knox had " boiled down " this part of the book a little more.

Calling for particular appreciation is the section on the diseases of bone. This, in reality, amounts to a well-illustrated monograph on the subject. It is virtually the only one in the English language, Shenton's book, good as far as it goes, being very incomplete.

Radiography of the alimentary tract is dealt with at length, 62 pages being devoted to it. This is a subject which, fortunately, lends itself well to text-book illustrations, it being possible to learn almost as much from reproduction as from actual plates. Speaking of the diagram of gastric lesions, the author refers to the fact that American writers say that there are now two schools : (1) the Continental, basing conclusions on a combination of clinical symptoms and various Röntgenoscopic manifestations of mobility, this is defined as the indirect method; and (2) the American, a direct school, basing its conclusions on the exhibition of the lesion itself. On this Dr. Knox pithily comments : " A third school might be referred to, namely, those who for several years have based their diagnoses upon the indirect *and* the direct evidences."

Finally, the technique of the examination of the urinary tract is carefully gone into, but one could have wished for a little more detail as to pyelography; more especially on account of the author's personal experiences in the collargol substitution, for the former is now unobtainable.

Altogether, a standard work, and one which we hope to see used in that university teaching of radiology, which has long obtained in the United States but is only just now being seriously considered in this country.

Materia Medica, Pharmacy, Pharmacology and Therapeutics. By W. HALE WHITE, M.D., etc. Sixteenth edition. Pp. xii + 716. London: J. and A. Churchill. 7s. 6d. net.

SINCE the first appearance of this most admirable text-book there has been published an edition at pretty uniform intervals of two years. This edition is the third since the new edition of the British Pharmacopœia on December 31, 1914. It is so short a time since we brought the previous edition under the notice of our readers that it is unnecessary for us to do more than indicate the features which distinguish this volume from its predecessors. For the most part these are confined to an Appendix (No. III.), in which are given the various official regulations affecting prescribing which have been issued as a result of the war. These regulations deal with the withdrawal from the pharmacopœia of numerous preparations containing sugar and glycerine; the prescribing and dispensing of cocaine, morphine, chloral hydrate, sulphonal and other similar drugs; the supplying of mercuric chloride and cocaine preparations for first aid treatment in eye injuries in workshops; and the prohibitions of certain amylaceous substances for other than food purposes. The comments on the glycerine and sugar problems are excellent. Notwithstanding war conditions the book is as well printed and as well bound as at any time in its career.

Shell Shock and its Lessons. By G. ELLIOTT SMITH, M.A., M.D., F.R.C.P., F.R.S., and T. H. PEAR, B.Sc. London: Longmans, Green & Co. Pp. 135. 2s. 6d. net.

A GOOD general account of shell shock will be found in this book. The term shell shock, as used by the authors, is to be understood as a " popular but inadequate title for all those mental effects of war experience, which are sufficient to incapacitate a man from the performance of his military duties," and it is rightly pointed out that such cases show no symptoms which were previously unknown. The need for special hospitals for the adequate treatment of patients suffering from these symptoms is insisted upon, and a review is given of the different methods by which the cases may be treated and of the value which may be expected in different instances from work, isolation, suggestion, hypnosis and psycho-analysis. The latter part of the book deals with the reforms which the authors consider should be made in the methods of treatment of general mental disorder, apart from that brought about by the war.

Spiritualism and Sir Oliver Lodge. By CHARLES A. MERCIER, M.D., F.R.C.P., F.R.C.S. Pp. 132. London: The Mental Culture Enterprise.

IN this interesting little book, Dr. Mercier examines in detail the evidence upon which the ideas of spiritualism are based. Perhaps the most valuable chapter is that which deals with the "Grounds of Belief," in which are set forth the general principles on which "Belief" should, as a rule, be based. So far as evidence supporting the existence of spiritualism is concerned, Dr. Mercier thinks that Sir Oliver Lodge has not proved his case, and considers the phenomena ascribed to spiritualism can be explained by natural causes. Dr. Mercier begins and concludes his book with Occam's aphorism: "Miracles are not to be presumed until natural causes have been ruled out."

Practical Points in the Diagnosis and Treatment of Heart Disease. By E. M. BROOKBANK, M.D., F.R.C.P. Pp. 148. Third edition, with illustrations. London: H. K. Lewis & Co., Ltd.

THAT a third edition has so soon been called for is proof that the book meets a want. The addition of typical pulse tracings and a new chapter on general signs and symptoms of heart disease will enhance the value of the book. The chapter on Routine Examination teems with valuable "points," and we note with pleasure the author's insistance upon the importance of light percussion. The section on Acute and Chronic Cardiac Muscle Failure should render the ascription of fatty degeneration of the heart less frequent at coroner's inquests as a cause of sudden death.

The book abounds in valuable hints for the diagnostician, such as the distinction between the apex-beat and the cardiac impulse. The diagrams illustrative of rhythmic changes, valve lesions and the various murmurs connected with them are effective and easy to follow. The chapter on Treatment is unavoidably unsatisfying, the subject not lending itself to "point" concentration. The remarks on diet, rest in bed, etc., are trustworthy.

So long as a book such as that before us is used only as a "refresher" after more complete treatises have been mastered, and ample clinical experience obtained, its value is undoubted. We have rarely seen such a book with the amount of reliable information in so small a compass as that now under review, and, with the limitations referred to, we heartily recommend it.

The Theory and Practice of Massage. By BEATRICE M. GOODALL-COPESTAKE. Pp. 251. Illustrated. London: H. K. Lewis & Co., Ltd. 8s. 6d. net.

THIS volume is addressed to the massage student, who will find that a knowledge of the theory of massage, as here expounded, should serve as a safe passport in the examination room.

The book is divided into three parts. The first includes a chapter entitled "Hints to Beginners," which is excellent. Short and simple accounts of the manipulations of massage, their effects and practical application are given, and the last two chapters are devoted to "Breathing Exercises" and "Some General Exercises." These are elementary, concise, and clear.

Part II. deals with surgical conditions and is the least satisfactory part of the three. The name of Lucas-Championnière is invoked when dealing with fractures, but the treatment described is not his; the advantages to be gained by massage treatment are not emphasized and the dangers not adequately expressed. The chapter on other recent injuries is also not abreast with modern teaching.

The third part deals with medical conditions and is, in our view, more satisfying, though it is bold to include rheumatism and gout in a list of the possible causes of appendicitis, and we do not subscribe that in gastroptosis "corsets should not be worn"—to quote only two examples of disagreement.

Perhaps the chief value of this work lies in the fact that quotations from other authors are frequent and the reference usually clear. It thus becomes an easy matter for the student to refer to other sources of information when in doubt or need. The illustrations are good and well reproduced.

Green's Manual of Pathology and Morbid Anatomy. By W. CECIL BOSANQUET, M.A., M.D., and W. W. C. TOPLEY, M.B., B.C. Twelfth edition. Pp. viii + 603. London: Ballière, Tindall and Cox. 18s. net.

THIS new edition of Green's Pathology has been revised throughout, and some parts have been entirely re-cast. Nearly a hundred new illustrations have been inserted, including four coloured plates. The revision seems to have been thoroughly well done, and the student and practitioner will find the book a reliable guide to modern pathology. An excellent summary is given of the various hypotheses of tumour formation, and immunity is dealt with clearly and concisely. A clear account is given of the diseases of the blood, and the coloured plates accompanying it are quite well done. The treatment of nutritional diseases and of diseases associated with the ductless glands strikes us as being the weakest part of the book. Thus gout is dismissed in a page and a half and diabetes in a couple of pages, diseases associated with the thyroid receive scant notice, and we do not find any reference to tetany. Diseases of the nervous system also seem to be granted less than adequate space. Subjects of topical interest, such as gas gangrene, trinitrotoluene poisoning, trench foot and trench fever, likewise receive no notice. However, these are small blemishes, and the new edition of Green's Pathology reflects credit alike upon authors and publishers.

How to Enlighten our Children. By MARY SCHARLIEB, M.D., M.S. Pp. 202. London: Williams and Norgate. 3s. 6d. net.

IF one had been asked to find an *ideal* author to deal with the subject of "how to enlighten our children" in the form of a book for parents, one could not have made a better choice than that of Dr. Mary Scharlieb, who holds the three-fold qualifications (all equally necessary) of woman, mother, and medical practitioner. Consequently, we have nothing but praise for this book. Its simplicity of diction is specially suited for its purpose as a book for lay parents, whilst its groundwork is thoroughly scientific. The woman's tact is shown to a considerable degree in dealing with the unsavoury subject of masturbation (or self abuse) both in girls and boys, and how best to counteract its influence. The habit is at first a physical and not a moral wrong, and "parents can do much to prevent the formation of evil habits by eliminating their causes, and they can do much to help their children to conquer the habits if once formed." In doing this, parents must avoid (*a*) the cruelty and folly of laying unjust blame upon the sufferers instead of laying it upon themselves, (*b*) the tendency to consider the practice a merely silly habit, which is bound to be cured when the sufferers' moral natures become strong or when marriage takes place, (*c*) the exaggerated view that some people take of the consequences of the evil, *e.g.*, insanity and death, a view "absolutely untrue." The book is arranged into nine chapters, dealing with (1) The Development of the Child, (2) Puberty and Adolescence in Girls, (3) The Difficulties of the Adolescent Girl, (4) Changes in the Adolescent Boy, (5) Special Knowledge for Boys, (6) How Life is Transmitted, (7) The Difficulties of Young Adult Life, (8) The Social Evil, and (9) The Consideration of Eugenics as a Safeguard.

Chapter III. The Difficulties of the Adolescent Girl is specially noteworthy as showing how the authoress deals with her subject, but in Chapters VII. and VIII. the subject of the Social Evil is somewhat out of focus with the rest of the book, being, in our opinion, too highly magnified —a result probably to be explained by the fact that the Royal Commission (Venereal Diseases) has just broken up, and Dr. Sharlieb was one of its most enthusiastic and brilliant members, all of whom have, practically, had little time to think of anything else but the social evil for the last few years.

The Biological Aspects of Warfare. By HARRY CAMPBELL, M.D. Pp. 44. London: Baillière, Tindall and Cox. 1s. net.

IN this booklet the subject of warfare is treated from the biological standpoint in a very interesting manner. The author traces the combative instinct to two primary factors: (1) the reproductive instinct, and (2) the struggle for food. Man's conduct towards his fellows has two "sanctions"—that of might and that of altruism, and both of these are considered. The influence of warfare in moulding the individual and the means of preventing warfare are discussed.

Two other essays are included: "The Factors which have determined Man's Evolution from the Ape" and "Claustrophobia."

Psychological Medicine. By MAURICE CRAIG, M.A., M.D., F.R.C.P. Third edition. Pp. 484. Illustrated. London: J. and A. Churchill. 15s. net.

THE excellence of Maurice Craig's work on psychological medicine is so well known that a brief allusion to the third edition is all that is required. The book has been brought thoroughly up to date and includes chapters on the aspects of the psychoses and neuroses produced by the war, and the methods by which they should be treated. Dr. Craig takes a judicial view of these methods and believes in the efficacy of well equipped special hospitals with workshops and facilities for open air employment to aid in the restoration of the exhausted nervous system. He weighs up the advantages and disadvantages of psycho-analysis, and considers that its usefulness as a curative measure has not yet been proved. The third edition of Dr. Craig's work can be strongly recommended to all who wish to obtain a good knowledge of the subject.

◆

THE PRACTITIONER.

JUNE, 1918.

SCALP FLAPS AND DEPILATION IN PLASTIC SURGERY OF THE FACE.

By PERCIVAL P. COLE, F.R.C.S.

Hunterian Professor, Royal College of Surgeons: Hon. Surgeon, King George Hospital; Assistant Surgeon, Cancer Hospital, etc.

THE use of a forehead flap to rectify facial defects is exemplified in the Indian method of rhinoplasty. This flap is, however, derived from a hairless portion of the scalp, and the resulting scar is by no means negligible. There is, moreover, an obvious limit to the amount of tissue available if the hair-bearing portion of the scalp is to be avoided. Hair grows freely on flaps transferred from the hairy scalp, and for this reason such flaps have not hitherto been utilized to remedy defects of hairless areas of the face. The advantages of a scalp flap are obvious. The area of tissue available is large, the residual scar is covered and screened from view by the surrounding hair, and the blood-supply is so good that no fear need be entertained about the nutrition of flaps reaching even to the mid-line of the vertex. It occurred to me that the disadvantage presented by the hair-growing proclivities of such a flap might be rendered nugatory by depilation. The known depilatory action of the X-rays suggested that this agency might be employed to good purpose as an aid to the plastic surgeon. The results obtained have been so satisfactory that brief notes are appended of typical cases treated on the lines indicated.

Corporal A. H., wounded by shrapnel, July 30, 1916, was admitted to the King George Hospital on September 13, 1916, his condition then being as shown in Fig. 1. The operation carried out on the lines indicated by Figs. 2, 3, and 4 (*see* next page), was performed on December 19, 1916.

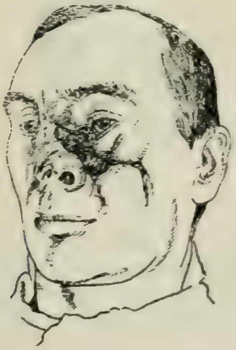


FIG. 1.

The flap was depilated by applications of X-rays, this process being completed in August 1917. (*See* Figs. 5, 6, and 7).

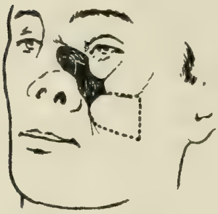


FIG. 2.

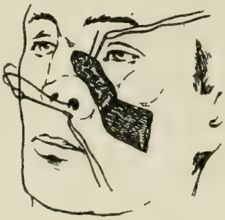


FIG 3.

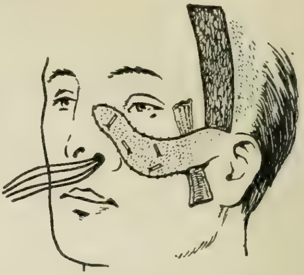


FIG 4

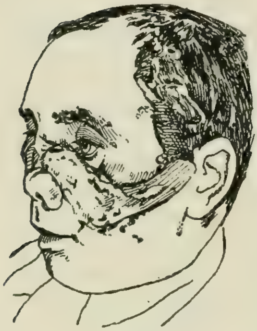


FIG. 5.

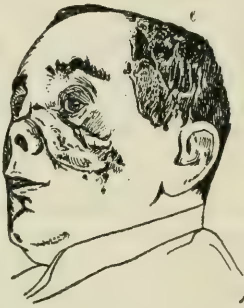


FIG. 6.

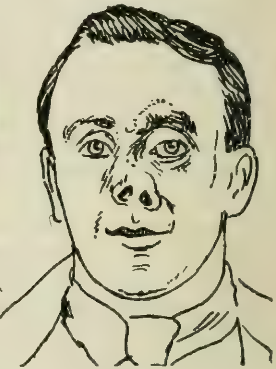


FIG. 7.

Private R. H., wounded August 27, 1916, was admitted to the King George Hospital under my care on July 17, 1917 (Fig. 8). Several operations—six at least—had been performed in attempts to close the defect depicted. These had consistently failed. He was operated on by me successfully, on July 27, 1917. Depilation was completed in December, 1917. (Figs. 9, 10, and 11.)

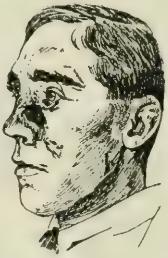


FIG. 8.

It has been urged by some radiographers that depilation by X-rays is either not permanent, or, if permanent, is associated with mal-nutrition and an eczematous condition of the skin so treated. These objections are not borne out in practice. No hair has grown on the flaps in the cases cited, and the skin is soft, supple, and perfectly healthy.

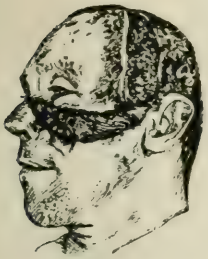


FIG. 9.

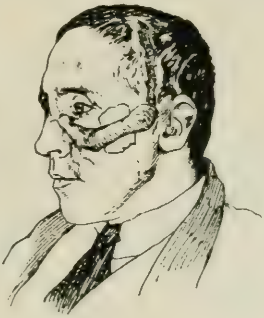


FIG. 10.

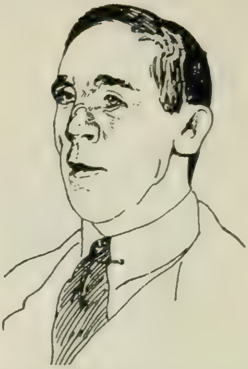


FIG. 11.

A similar procedure has been adopted in some cheek defects, the depilated area of skin being inverted to replace mucous membrane.

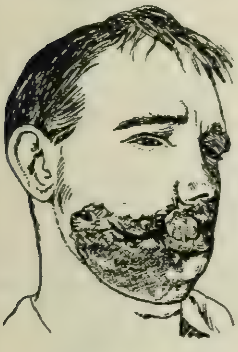


FIG. 12.

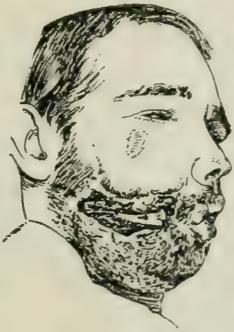


FIG. 13.

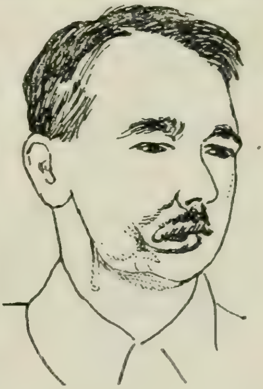


FIG. 14.

Reproduced from photographs taken before and after operation.

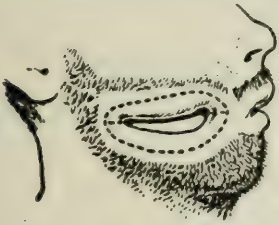


FIG. 15

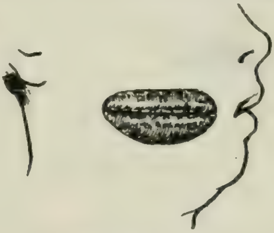


FIG. 16.

Dotted line surrounds depilated area.

(*See* Figs. 12–18.) The method is diagrammatically illustrated in

Figs. 15–18.

The use of scalp flaps to remedy defects in hair-bearing areas of the face is by no means new. The formation of a complete upper lip by means of bi-lateral, transferred, pedicled scalp flaps is, however, I believe, an entirely novel departure in plastic surgery. The operation devised to this end was performed by me on July 6, 1917. The method employed is clearly indicated, and the stages shown pictorially in

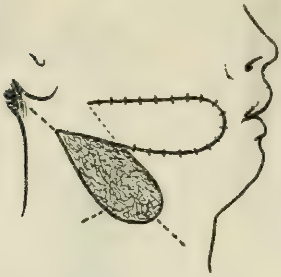


FIG. 17.

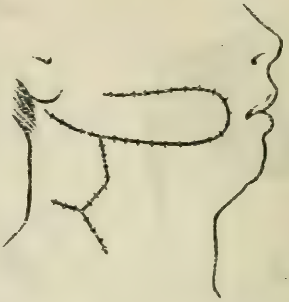


FIG. 18.

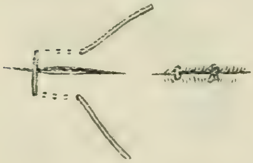


FIG. 18*a*.

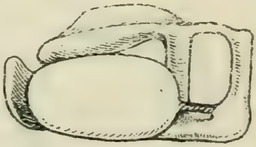


FIG. 18*b*.

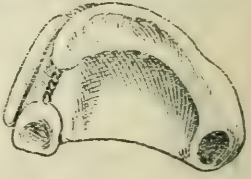


FIG 18*c*.

Stitch used to invert. Splint worn to maintain contour of cheek.

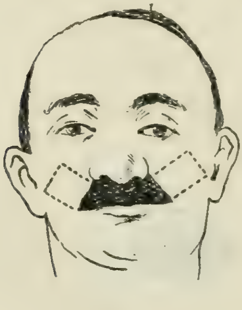


FIG. 19.

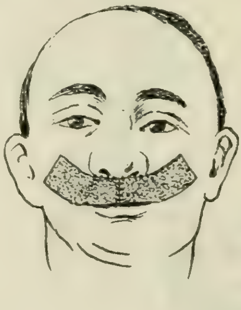


FIG. 20.

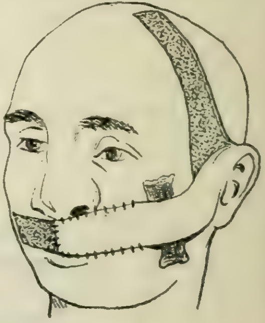


FIG. 21.

Figs. 19–22. Reproductions from photographs (Figs. 23–27) illustrate the actual progress of the case. This operation was the last of many to which this patient was necessarily submitted. When sent to me the mandible was viciously united, and the mouth cavity was practically non-existent. In the last picture it will be noted that minor defects are obscured by a well-grown moustache of natural origin.

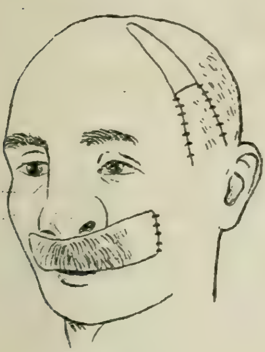


FIG 22.

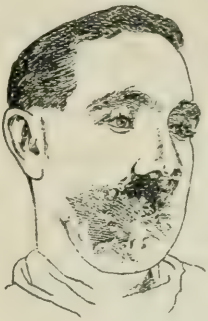


FIG. 23.

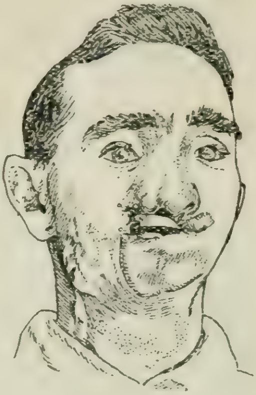


FIG. 24.

A consideration of the cases herein briefly typified suggests that the scalp is a region that should more frequently be pressed into service by the plastic surgeon. Full details as to the technique employed by Captain Robert Knox will be found in his recent book.*

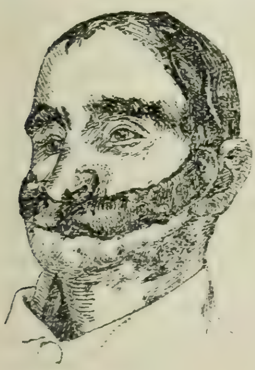


FIG. 25.

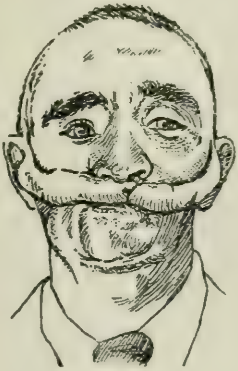


FIG. 26.

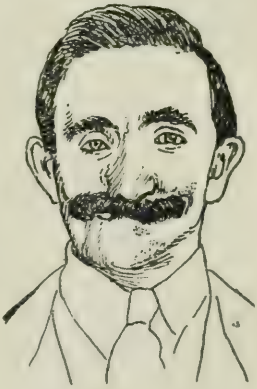


FIG. 27.

---

* *Radiography and Radio-Therapeutics,* Vol. II.

A METHOD FOR THE RADICAL CURE OF INGUINAL HERNIA (DARN AND STAY-LACE METHOD).

By W. SAMPSON HANDLEY, M.S., F.R.C.S., Capt. R.A.M.C.(T.).

Surgeon to the Middlesex Hospital, etc.

The work of R. W. Murray, of Liverpool, and other surgeons has shown beyond doubt that the sac of nearly all inguinal herniæ has existed from the beginning of life. Murray states that in the child, and even in the infant, the sac, in most cases, is entirely separated from the tunica vaginalis, and exactly resembles that found in the adult. He quotes the case of a young man, who had never been ruptured previously, in whom a large scrotal hernia appeared suddenly after lifting a heavy piece of lumber. On operating, Murray found that the sac was extremely thin and unconnected with the tunica vaginalis, the natural inference being that the hernia had suddenly been forced into a patent process of processus vaginalis or pre-formed sac. The sac, therefore, exists from birth, and is not manufactured from the peritoneum by a slow pushing-out process; some day or other, the hernia descends into it. These statements refer only to the indirect form of inguinal hernia, and do not apply to the direct variety.

Later, Murray gave the result of careful *post-mortem* examination in 200 males, nearly all adults, in whom there had been no history of hernia during life. In 47 individuals—30 males, 17 females—there were found present 68 definite diverticula or pre-formed sacs, potential hernial sacs, although in none of these cases had an actual hernia descended. In 16 cases, more than one diverticulum was found. 58 of the 68 diverticula were femoral, and the remainder were inguinal. It is a matter of chance, depending on the degree of intra-abdominal pressure present, whether the pre-existing sac is ever made evident by the descent into it of some of the abdominal contents.

The pre-existence of the sac has been held, by some surgeons, to justify the belief that complete removal of the sac is all that is necessary to accomplish the radical cure of hernia, but this is probably true only of small herniæ which have not descended and weakened the inguinal canal.

It is, indeed, probable that in children even large herniæ may be satisfactorily treated by a simple excision of the sac, owing to the fact that in young subjects much may be hoped for from the elasticity of the tissues and the vigour of the muscles. Mr. T. H. Kellock, who has had great experience in treating herniæ in children, is quite convinced that complete removal of the sac, without slitting up the inguinal canal at all, is all that is necessary in young subjects. He pulls on the cord until he drags down the sac sufficiently to enable him to reach the neck, and he has invented a very useful instrument, shaped like a tuning-fork, by which one can push the tissues back, enabling the operator to get to the neck of the sac; for the greatest fault which can be committed in operating on hernia is to remove the sac incompletely. The neck can be recognized by the presence there of the white line, which represents the point of junction of the peritoneum with the sac.

But however satisfactory mere removal of the sac may be in children, I feel sure that in a fairly high proportion of herniæ in adult life something more is required.

There is a well-defined class of hernia in the adult, in which the fibrous structures of the canal, especially the external oblique aponeurosis, are congenitally weak. The external oblique aponeurosis, instead of being a stout opaque layer, may be a thin membranous semi-transparent structure, showing obvious fusiform gaps here and there where it has partly split. In these situations it seems to be composed only of the intercolumnar fibres. Frequently, in such cases, the external ring is prolonged as a linear split some distance up the inguinal canal, and even as far as the internal ring. The external ring thus assumes the outline of a candle flame. When such a split has occurred, an instrument introduced into the canal shows its anterior wall to be composed only of a thin transparent membrane, which can be made to bulge forwards considerably by slight pressure with the instrument within. These conditions may be found fully developed before any hernia has appeared. They predispose especially to the direct form of hernia, particularly if associated with laxity and weakness of the conjoined tendon, which is frequently the case. But they are also likely to assist the descent of the bowel into a preformed indirect sac, which might otherwise have remained empty. In a recent case of the kind, I found an indirect hernia on the left side. On the right side, there was a diffuse impulse on coughing with general bulging over the whole inguinal canal. The external ring was split upwards in the manner described, but on this side there was no hernial sac. In this case, from a comparison of the two sides, it appeared clear that yielding of a jerry-built inguinal canal, under the strain of war-work, was the determining factor in the descent of a hernia into the preformed empty sac on the left side. In such a case, the mere removal of the sac would probably be followed by the descent of a direct hernia with an acquired sac of peritoneum.

In these cases, in which yielding of the inguinal canal is the primary fault, something more is necessary, namely, a well-devised attempt to strengthen the weak walls of the canal.

The same thing applies, when an originally strong and sound inguinal canal has been stretched and distorted out of all recognition by a large hernia of long standing. Here, too, mere complete removal of the sac is inadequate, and I confess that even in small and recent herniæ in the adult I do not care to trust to simple removal of the sac. It is surely better to seize the opportunity to reinforce the inguinal canal. The popular method for accomplishing this desirable object is Bassini's. In this operation, the inguinal canal is slit up from top to bottom by an incision about half an inch above Poupart's ligament. When the sac has been removed, the cord is dragged out of the way by means of a retractor, and a series of stitches is introduced binding down the conjoined tendon to Poupart's ligament. The cord is replaced, and the external oblique sewn up.

This method is, I think, open to criticism in several particulars. When the conjoint tendon is sutured down to Poupart's ligament, it is brought into an abnormal position, and the stitches which hold it are subject to tension in preventing its recoil to the natural arched position. Under these circumstances there is a likelihood that the tissues in the grasp of the stitches will undergo pressure-atrophy; in other words, there is the chance that the stitches will cut through, that the conjoint tendon will return to its normal position, and that, consequently, a gap will re-appear in the posterior wall of the inguinal canal. If that does not happen, the increased tension to which the conjoint tendon is subject may actually split that tendon, and allow a direct hernia to come down through the split in the conjoint tendon. It also seems certain that after the external oblique, forming the anterior wall of the inguinal canal, has been slit up and re-sutured, the line of suture is weak; it constitutes a weak spot, which may therefore yield and permit a general bulging forward of the inguinal canal. Recurrence of the hernia is then likely.

Halstead has endeavoured to minimize the second risk referred to, that of bulging of the external oblique, by suturing the muscle with an overlap. The first row of sutures picks up the edge of the lower flap, and the deep surface of the upper one, about quarter inch from its edge. When that has been sutured, the upper flap is brought down and sewn on to the surface of the lower flap. There is now, accordingly, a double layer. The disadvantage of this method is, that it increases the tension on the external oblique in a direction at right angles to that of its main fibres; that is to say, it increases the liability to splitting of the fibres of the external oblique. The only obstacle to the splitting is the weak inter-columnar fibres or system of fibres.

Mr. Lawrie McGavin, in this country, has been the principal exponent of another method of meeting this disadvantage of Bassini's operation. Mr. McGavin advocates the use of a silver filigree which, lying on the peritoneum, strengthens the weak posterior wall of the canal. The filigree is placed on the peritoneum under cover of the conjoint tendon, reaching down to Poupart's ligament, and extending up as far as the internal ring. Another, accessory, filigree is recommended by Mr. McGavin. The filigree is simply placed on the peritoneum, and the external oblique is sewn up over it.

The method is, no doubt, excellent, but personally I have found a difficulty in introducing the filigree into its rather cramped bed without distorting it. If this happens, the patient is liable to pain and inconvenience from the pressure of angular portions of filigree upon the surrounding structures.

What is the effect of introducing a filigree into the tissues? The same thing happens as after the introduction of any other foreign body; that is to say, the foreign body is encysted, by being surrounded with a layer of fibrous tissue. Each of the threads of the filigree becomes surrounded by fibrous tissue, which is, itself, adherent to its surroundings, so that the filigree is strengthened and held in place by this system of newly-formed fibrous tissue.

Let me now describe a method which I have been using for some time. It secures, I think, the advantages of the filigree operation in a simpler way, and along with certain of its own.

The stages of my "darn and stay-lace" operation are as follows :—

Step 1.—Skin incision.

Step 2.—Slitting up of the external oblique from the internal to the external ring. Frequently, it will suffice to incise the aponeurosis over the internal ring without prolonging the incision into the external ring; but if the external ring is abnormally large, it is best to slit up the canal completely.

Step 3.—Separation of the sac from the cord and its removal. Retraction of the cord upwards out of the way. So far the steps of the operation follow conventional lines.

Step 4.—Insertion of a slack "stay-lace" of stout silk, filling up the triangular interval, bounded above by the lower edge of the conjoined tendon, below by the edge of Poupart's ligament, and externally by the internal abdominal ring. (Fig. 1.)

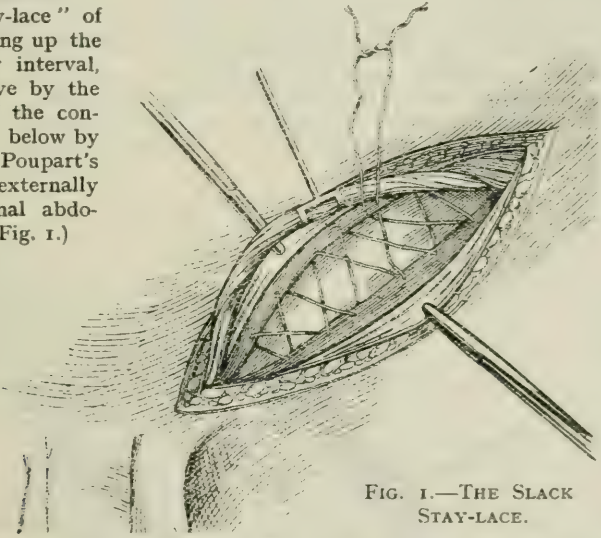


Fig. 1.—The Slack Stay-lace.

The needle is entered through the edge of the conjoint tendon, immediately internal to the internal ring, then at a point vertically below it takes up Poupart's ligament from within the inguinal canal. It now returns and takes up the conjoint tendon, then Poupart's ligament at a succession of points approaching nearer and nearer to the pubic spine. Having come to this point it now retraces its steps, taking up each time either the conjoint tendon or Poupart's ligament at points intermediate to the stitches already inserted and successively nearer and nearer to the internal ring. Then the ends are knotted together. But it must be specially noted that the stitch is not pulled tight; it is left quite lax. Much care must be exercised during the tying of the knot to ensure that the stitch does not run up taut during the process, and that on the other hand the knot is very securely tied. It will simplify this step if, during the tying of the knot, the assistant grasps the threads just behind the knot with two pairs of non-serrated forceps. Serrated forceps are apt to injure and weaken the silk where they grasp it. By the insertion of this slack "stay-lace," a sort of entanglement of silk is formed which prevents any descent of a future hernial sac.

Step 5.—The cord which has been dragged upwards is replaced and the external oblique is sutured by a few interrupted silk sutures. The size of the external ring is reduced if necessary.

Step 6.—Now comes the process of "darning," which aims at strengthening the external oblique. The surface of the external oblique aponeurosis is cleared down to Poupart's ligament, upwards two inches beyond the cord, outwards well beyond the internal ring. The cleared area is now darned exactly as if it was a weak spot in a stocking. The threads are inserted parallel to the intercolumnar fibres and at right angles to the main fibres of the external oblique aponeurosis. Beginning at the upper and outer angle of the cleared area the needle picks up the surface of the external oblique, and, as it descends to Poupart's ligament, it takes up and emerges from the aponeurosis at five or six points. From Poupart's ligament it ascends again just internal to the line of its descent, again picking up successive points of the aponeurosis. It alternately ascends and descends, approaching more and more to the middle line until the inguinal canal, as far as the external ring, has been covered over by the darn. The successive stitches are to be gently pulled through so that they lie straight, but on no account is any tension to be applied to them. When the darn is complete the ends of the stitch are simply cut off at points quarter inch from their points of emergence from the aponeurosis. There is no need to secure them in any way by a knot. (Fig. 2.)

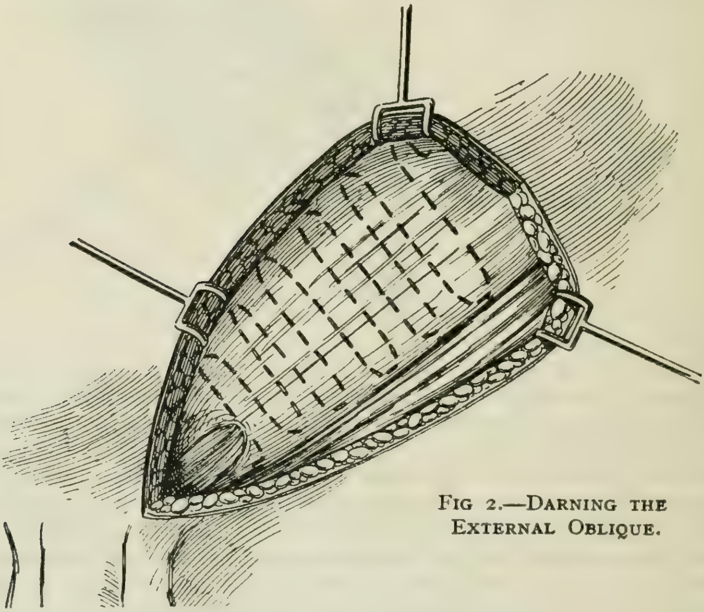


Fig 2.—Darning the External Oblique.

Step 7.—Suture of the skin completes the operation.

RATIONALE OF THE METHOD.

Every silk fibre embedded in living tissue becomes encysted by a tube of fibrous tissue, which is adherent both to the silk and to its surroundings. In the case of the slack "stay-lace," which strengthens the posterior wall of the canal, there are no firm surrounding structures upon which the fibrous sheath around the silk can get a grip. Here the strain must be taken by the silk itself, which accordingly must be firmly knotted and take frequent hold of the nearest available substantial structures, *i.e.*, Poupart's ligament and the conjoined tendon. The strain is intermittent, only occurring during straining efforts. There must be no constant tension, which by pressure-atrophy, would ultimately destroy the hold of the silk on its points of support. This is the essential difference between my method of strengthening the posterior wall of the canal and Bassini's method.

The darn in the external oblique, which strengthens the anterior wall of the canal, provides, when its encysting fibrous sheath has formed, a new and powerful set of intercolumnar fibres adherent along their whole length to the strong texture of the external oblique aponeurosis as well as to the silk. Any strain produced by increased abdominal pressure is met by a strong girder-like construction of two systems of fibres, lying at right angles to each other and fixed together wherever they cross. The integrity of this system does not require any fixation of the two ends of the silk.

As I have already said, the necessity of strengthening the intercolumnar fibres can frequently be demonstrated in the operating theatre. In a recent case, I found the external ring prolonged as a split in the external oblique aponeurosis right up to the internal ring. It is not rare to see two or three splits or obvious weak spots in the aponeurosis over the inguinal canal. Apart from such obvious defects, after the canal has been split up during the operation, the aponeurosis is certainly weakened if it is merely sutured together in the ordinary way. I believe, therefore, that "darning" the aponeurosis should be a routine step in all cases in which the canal has been split up. The effect of the operation in strengthening the inguinal canal is not merely a theoretical one. I have frequently demonstrated it to my class in hospital. There is a slight but appreciable increase of resistance over the darned area, palpable with the hand. When the patient coughs, there is no general bulging of the inguinal region, such as may often be seen on the opposite side; that is to say, the side operated upon is now actually stronger than the side on which no hernia has existed.

I have applied the method with success to a considerable number of cases, including a large inguinal hernia, twice recurrent after operation, in a young child. It has, I think, special advantages at the present time, when within a short period of his operation a man may be called upon to meet the violent strains of military service.

A NOTE ON DREAMS.

By F. PARKES WEBER, M.A., M.D., F.R.C.P.

THE teaching or claims of Freud and his followers, that nearly all dreams allow of an obvious or latent (cryptic) sexual interpretation, is generally regarded, at any rate in this country, as being opposed to common experience and as being, in fact, preposterous. Some dreams may, indeed, be full of sexual significance, and occasionally even may be connected with the so-called "Œdipus-complex," or "incest-complex," of the Freudian school, but in the large majority a specially sexual significance is probably altogether absent. It may always be argued that a sexual significance is present, but latent, of a cryptic, symbolical kind, but almost any meaning may be squeezed out of almost any thought or dream by an appeal to symbolism, involving as it does an artificial interpretation of supposed symbols; that is to say, an interpretation according to some artificial scheme of explanations that has been drawn up by experts, and one that quite fails to satisfy what ordinary minds regard as common sense. Sir Robert Armstrong-Jones (THE PRACTITIONER, 1917, Vol. 98, p. 216), takes the following view :—

> "This sexual theory is over-emphasized, and the Freudians, who urge sex as the basic origin of all dreams, of all obsessions, and of all longings, impulses, and neuroses, are *sex-intoxicated*, for in life's reality there are other primary and original instincts as well as sex, of which fear, anger, hunger, and the search for warmth are the commonest examples. All these run deep in the unconscious mind, and each has suffered far more repression than sex. It is against human experience that all dreams are desires, and it is repulsive that all dreams should be interpreted as relating to sex, and such an explanation has brought these conclusions of what have been called *chimney-sweeping investigations* into deserved disrepute."

Ordinary experience seems to explain dreams as a kind of hallucination (visual, auditory, etc.) of the subconscious mind, or rather of the border region between the subconscious mind and the fully conscious mind—founded on or suggested by incidents, impressions, or thoughts in the dreamer's previous, generally quite recent, life—often distorted, disconnected, or fantastic, owing to the necessary absence of control by the higher conscious mind (the psychical controlling mechanism), and often, therefore, untrue to life and opposed to the dreamer's character, at least, his character under the guidance or control of his conscious mind. They probably, as Bergson has pointed out, result from "relaxed consciousness," in other words, from a relaxation of conscious mental control, and therefore what a person during sleep dreams that he does (his action in his dreams) is often out of keeping with what is known of his previous life. Such an explanation would, doubtless, be found to be supported by rough estimates, and I suppose that in about nine cases out of ten the correct source or starting-point of dreams can readily be found in the dreamer's previous experiences, what he has done, witnessed, listened to, been told of, read of, thought of, approved of, disapproved of, or discussed; that is to say, it can be found in his previous (generally recent) life. What need, then, is there to wring out some supposed hidden significance from dreams by the help of obscure symbols or by an elaborate and very artificial and strained system or scheme of symbols? In regard to the sexual interpretation of all dreams, one might just as well seek to explain all the fancies and hallucinations of delirium tremens and all the delirious ideas and delusions of fevers and acute mania as if they all rested on a sexual basis.

What proportion of life and life's experiences is strictly of a sexual nature in the average individual? This doubtless varies greatly in different individuals; but in most human beings the greater portion of life (when summed up in terms of time) is lived without powerful sexual emotions. The bulk of ordinary emotions in life is not of a sexual nature, but is merely sprinkled with sexual intervals. What has been stated on the subject in bygone times, when the general public was, as a rule, little reticent on sexual matters, and did not endeavour so much as now to conceal the sexual factor in ordinary life? I will purposely select "sensual" views on the subject. Then as now, to the average kind of sensual individual, "life," or the sensual gratification of life, was largely a matter of eating and drinking, satisfying to the full the imperious basic instincts of preventing starvation and thirst; of hunting, sport, outdoor games and bathing, obtaining food and keeping one's body in health by suitable muscular exercise, cleanliness, and friendly competition; indoor games, music, art, and social amusements, satisfying the instinct for ordinary pleasant domestic and social recreations and emotions. Sexual matters, that is to say, functions and emotions connected with the instinct of reproduction, have always taken their due part in popular ideas of "life," though this is by no means such a large and exclusive part as some modern writers have apparently supposed.

A Latin inscription in three lines, quoted by E. Le Blant,* is: VENARI LAVARI LVDERE RIDERE OCC (for HOC) EST VIVERE ("to hunt, to bathe, to play, to laugh—is to live"). Bathing is likewise included amongst the "Epicurean" joys of life in an epigram from the Greek Anthology (by Rufinus, English version by Francis Fawkes):—

"Let us, my friend, in joy refine,
Bathe, crown our brows, and quaff the wine:
Short is the space for human joys;
What age prevents not, death destroys."

A late Latin couplet is as follows:—

"Balnea, vina, Venus corrumpunt corpora nostra,
Sed faciunt vitam balnea, vina, Venus."

(This means: "Baths, wine, and sexual enjoyment destroy our bodies, but they constitute life.")

---

* *See* Le Blant's article in *Mémoires de l'Académie des Inscriptions* Paris, 1898, Vol. 36, p. 13.

Witness also the high place the Roman Emperor, Hadrian, assigned to play and jokes amongst the delights of mortal existence. In the well-known verses, addressed by him to his own soul shortly before his death, he specially mentions the loss of the agreeable *joci* of human life as a cause for regret:—

> "Animula, vagula, blandula,
> Hospes comesque corporis,
> Quæ nunc abibis in loca,
> Pallidula, rigida, nudula,
> Nec ut soles, dabis jocos?"

So, also, Horace (*Epist.*, ii., 2, line 214), in regard to his own life, humorously, reluctantly, admits:—

> "Lusisti satis, edisti satis atque bibisti;
> Tempus abire tibi est."

("You have played enough, eaten enough, and drunk enough; it is time for you to depart.")

Since in ancient and primitive beliefs regarding deity and existence after death "anthropomorphism" (*i.e.*, the "anthropomorphic factor" in religions) naturally plays a very great part, most things that ordinary mortals enjoy and long for during life, are found reflected in the delights which have been supposed to be reserved for the blessed in the abodes of bliss after death. Thus from such beliefs we can obtain hints as to what probably "constituted life" in the opinion of the average sensual man of bygone times. According to ancient and primitive beliefs, though sexual attractions found a place amongst the blissful pleasures of the blessed in their supposed abodes after death (*e.g.*, "houris" of the Mohammedan Gardens of Paradise, etc.), delights, that is to say, what ordinary men of the period regarded as yielding blissfulness during life, connected with basic instincts and emotions other than sexual, found an equally or more important place. Thus, the pleasures and ambitions connected with the imperious animal instinct of self-preservation and obtaining food, are represented by the fighting of the Valhalla warriors, the hunting paradise of the North American Indians, the posthumous feasts and revelling of the Teutonic and Scandinavian heroes, and the sepulchral after-world "symposia" or banquets of the ancient Greeks and Romans. The habits connected with the instinct of keeping the body and muscles in a healthy condition are represented by the athletic exercises and contests, chariot-racing, outdoor games, bathing and dancing in the Elysian fields of the Greeks and Romans. The enjoyment of singing, music, non-athletic games, like draughts, and the ordinary amenities and pleasant emotions of human social life on earth, are represented by the angelic orchestras and choirs of the mediæval Christian heaven, and the family scenes, with playing of draughts, etc., of the ancient Egyptian idea of the land of the blessed (*vide* the illustrations in the famous papyrus of Anhai—about 1040 B.C.—and in the papyrus of the scribe Ani—about

1500 B.C.).

We may safely take it, therefore, that amongst ordinary sensual human beings of past and present times the basic and dominating desires and enjoyments of fully conscious (wakeful) life have been by no means limited to those of the sexual class—and so it is with dreams. The sexual element in dreams is doubtless greater than the sexual element in wakeful life, which is under the conscious mental guidance; but sexual ideas, emotions, etc., do not by any means monopolize dreams. Ordinary individuals dream of ordinary incidents in their daily life, their ordinary occupations, duties, work, recreations, pleasures, successes, failures, disappointments, eating and drinking, riding, hunting, shooting, outdoor and indoor sports and games, music, art, and "hobbies," social entertainments, conversations with friends, etc. Naturally, in disordered states of the higher nervous system, due to shock, overstrain, fatigue, toxic conditions, fevers, etc., and, when the stomach or intestines are distended or diseased, nightmare-like dreams of a terrifying nature are not uncommon. A neurotic child, brought up in an atmosphere of fairy tales of old-fashioned days, is likely often to dream of witches, hobgoblins and man-eating ogres. A young woman saturated with the vampire legends of Eastern Europe, during the delirious stage of acute pneumonia, might have fancies resembling those of Lenore in G. A. Bürger's well-known ballad (translated by Sir Walter Scott). So soldiers, during and after the dangers and strain of active warfare, may be restless and call out in their sleep, owing to exciting or terrifying dreams, as described by Lucretius and Shakespeare.

F. W. Mott, indeed, in his paper on the "Psychology of Soldiers' Dreams,"* in which he gives the appropriate quotations from Lucretius and Shakespeare, has pointed out that fear, terror, and horror, connected as they are with the fundamental instinct of self-preservation, are at least just as likely to be represented in dreams as sexual ideas and emotions. The latter are connected with the important instinct of reproduction (propagation of one's kind and survival of the species), but the instinct of self-preservation is probably still more basic and still more dominating; both are, of course, especially powerful when the highest mental guidance is impaired, and when subconscious influences are allowed more or less uncontrolled play.

From whichever way one regards it, therefore, whether from the point of view of ordinary human experience or from that of theoretical probability, the Freudian teaching that nearly all dreams have a sexual explanation, is most unlikely to be true, or the element of truth in it is so exaggerated as to appear preposterous. But for those who seek a cryptic explanation on any subject, and by a kind of infatuation or self-suggestion believe that they have found one, no gulf in their line of argument is too broad to bridge over, no mouthful of improbability is too large to swallow, in order to convince themselves that they have proved the correctness of their arguments. Witness the futile, though sometimes at first sight plausible, arguments and the wasted time (in searching for cryptographic clues, etc.) of those who set out to prove to others—after having almost convinced themselves—that the plays of Shakespeare were the work of Francis Bacon. Again, when King Alexander I. and Queen Draga of Serbia had been murdered in 1903, many postage stamp dealers and collectors, looking out for an ill-omen preceding what was then already an accomplished fact, attempted, with some amount of success, to convince others that on certain Serbian postage stamps, issued not long before the tragic event in question, a tiny death's head had been somehow introduced into the design; but so "cryptic" was it that many ordinary persons failed to recognize it even when it was pointed out to them.* There are certain old Italian medals and plaques, cast in bronze during the sixteenth and seventeenth centuries, and perhaps later, which represent a fanciful profile portrait, sometimes called a head of "Attila." On minutely inspecting the portrait, one is surprised to find it resolve itself into a number of *phalli*, each phallus consisting of penis and scrotal sac. The nose, the ear, the lips, the chin, the cheek, the eyebrow, the hair, etc. are made up of these phallic emblems skilfully pieced together so as (all of them together) to represent the portrait in question. Several minor works of art, if they can be thus styled, of various periods are in existence in which either phalli or death's heads or other symbols or emblems have been purposely concealed by the artist, who has evidently taken a delight in his skill in this direction. There have been collectors and archæologists, however, who have sought to find a cryptic phallus, or phallic signification, in most ancient (primitive) monuments and customs. Some of these investigators of origins may, indeed, have been said to have serpents and phallic emblems "on the brain." Similarly, some modern followers of Freud seem to have sexual explanations for almost everything, and sexual symbolism "on the brain."

---

* Psychiatric Section of the Royal Society of Medicine, January 8, 1918 (*Lancet*, London, 1918, Vol. i., p. 169).

When Freud's writings first became widely known, brilliant results were expected from his methods of psycho-analysis as a mode of investigating both pathological and non-pathological questions of psychology, but the sexual interpretation of almost all mental phenomena—anxieties, obsessions, dreams, delusions, etc.—according to the present teaching of Freud and his school, could hardly have been expected, and to the minds of most ordinary individuals has come to clash with what they regard as commonsense evidence. The sexual instinct doubtless plays an immense part in the conscious and subconscious life of most individuals, but there are many other *driving motives in life* besides those connected with sex, not to mention those very powerful ones—rivalry, resistance, and fear—connected as they are with the instinct of self-preservation. In the relatively primitive mental eyes of the ancient world, "life was constituted," not merely by sexual enjoyments and emotions, but, as I have above endeavoured to point out, by eating, drinking, hunting, games, social amusements, etc. So also nowadays, most persons cannot bring their intelligence to recognize the exclusiveness of the sexual factor, claimed by the Freudian school, in the mental phenomena of ordinary and morbid life. I do not believe that the elaborate Freudian explanation of dreams and morbid ideas by symbols is justified in the majority of cases by actual facts. Most persons do not usually think in symbols nor dream in symbols. Apart from all this, however, a future of great usefulness may lie before methods of psycho-analytical investigation in many psychological problems.

---

* This reminds one somewhat of a so-called *Cherchez la femme* game or pastime in which children and adults amuse themselves by searching for a lady's face, carefully concealed in specially designed printed pictures; one finds it in the foliage or trunk of a tree, on the ground, at the corner of a rock or in any unlikely place in the landscape or other subject represented, but one can sometimes find it only by a most careful search and by turning the print around so as to inspect it in every possible position.

THE TREATMENT AND DEGREE OF CURABILITY OF NEURASTHENIA PURA.

(*Concluded.*)

BY SIMON HARRY BENNETT, M.D., CH.B.

Glasgow.

(d) *Hydrotherapy.*

PRACTICALLY all writers on neurasthenia give prominence to hydrotherapeutic measures as exerting a sedative and ameliorating influence on the neurasthenic state. I have come to the conclusion, however, that many of the hydrotherapeutic practices advocated are not beneficially applicable to true neurasthenia. Generally speaking, the ordinary warm bath invariably increases the feeling of neuro-muscular exhaustion in the neurasthenic, whilst the intolerance of cold which most patients exhibit, renders the employment of the cold or even tepid bath distinctly injudicious. For the same reason, too, I have discarded as inapplicable, the use of the wet pack, with or without friction. I have no experience of the effects of vapour baths in neurasthenia, but even if these were useful, which I very much doubt, the fact that the patient would have to go to some bathing establishment among unsympathetic strangers to get such baths is, I urge, a very strong argument against their employment, at least in the early stages of treatment.

There are two simple hydrotherapeutic measures which I have found to exert a distinctly sedative action in neurasthenia, which are easy of accomplishment and which are accessible even to the poorest. To carry out the first of these, the patient sits at the edge of the bed, with his limbs and front part of the trunk covered by the bedclothes, and the back, except the head and vertebral column region of the trunk, covered by a thick towel. Cold, ordinary tap water, is gently poured from a jug at the nape of the neck, so that it flows right down the exposed skin of the back, that is, over the entire length of the vertebral column. A mackintosh is placed at the edge of the bed and the trickling water from it allowed to flow into a receptacle. It may be necessary, every now and then, to interrupt the flow of water down the spine, according to the degree of tolerance of the patient. The procedure is continued for about three or four minutes, during which time a number of jugs of water will have been used; it should be practised twice daily, night and morning. This simple measure is a very useful weapon in the physician's therapeutic arsenal to combat neurasthenia, for although its sedative action is more or less temporary, it constitutes a very effective auxiliary to other more specific therapeutic measures. I believe it exerts its sedative effects partly through the vascular system superficially and deeply, thus diminishing the sensibility of the spinal system of nerves, and partly by depressing the sensory end organs of the skin over the spine, and thus inducing a slight degree of anæsthesia or diminishing the spinal hyperæsthesia which is usually present. The fact that it relieves or temporarily removes rachialgia when present, is proof of its analgesic effect.

The second hydrotherapeutic measure which I employ is, in reality, a modification of the first; instead of pouring cold water down the spinal region, several thicknesses of linen or towelling, the width of the exposed skin of the spine, are frequently soaked in cold water and applied to the skin.

Both methods are equally effective, and they possess the distinct advantage, besides the therapeutic one, that the patient during their application is thoroughly protected from the risk of catching cold.

(e) *Dietetic Treatment.*

I have elsewhere[1] indicated that when alimentary disturbance exists in neurasthenic patients, it is invariably to be regarded as an associated condition, contributed to, perhaps, by the nervous asthenia, but that it rarely, and then only very indirectly, has influenced the supervention of actual neurasthenia. Special attention to the diet, therefore, is only indicated if the neurasthenic suffers from an associated malnutrition, pointing to the existence of definite digestive disturbance. In such patients, along with appropriate medicinal remedies, a dietetic regimen best adapted to the relief of the alimentary derangement is given. In all acute cases, however, I enjoin abstention from tea and coffee, these being liable, by day, to increase the patient's excitability, and, by night, to aggravate the tendency to insomnia.

Systematic overfeeding, a cardinal point in the Weir-Mitchell method, I regard as a senseless measure, which, by itself, I am certain, could effect no material improvement in the neurasthenic state. Many patients, before submitting themselves to me for treatment, had already followed the principle of overfeeding, without any appreciable improvement in their condition resulting. What sense is there, and what justification, in making the neurasthenic, whose state of bodily nutrition is normal, overfeed, particularly when he is undergoing a rest cure as in the Weir-Mitchell method or the modified method which I employ? It can only lead to an increase in the body-weight, which, more often than not, means an increase in superfluous (adipose) tissue. So far, therefore, as the question of diet is concerned, I am guided by the state of bodily nutrition of the patient, his digestive powers, and the co-existence of any gastric or bowel derangement. I institute measures to combat any alimentary fault when this exists, which implies that special diets will be called for in special cases, and to raise the digestive powers when these are below the normal. But, generally, the dietetic principles to be adhered to are—(1) a sufficiency of plain but nutritious food; (2) efficient mastication; (3) and strict regularity in meals.

My neurasthenic patients have improved without any special attention to the question of dietetics beyond these simple measures.

(f) *Medicinal Treatment.*

In all cases of neurasthenia, medicinal remedies can be employed with advantage. As previously indicated, when there is an associated alimentary disturbance, appropriate medicinal measures to combat this are required. Medicinal treatment proper must embrace the exhibition of drugs, (*a*) directly affecting the nervous system; (*b*) having an aperient action; and (*c*) to promote sleep.

Drugs directly affecting the Nervous System.—Bromides are the nerve sedatives *par excellence* in this disorder. In every case, I administer a mixture containing ammonium or potassium bromide, and in cardiac neurasthenics, extract of hyoscyamus in addition. In the latter class of case strychnine is not tolerated, because it increases the tachycardia, and must, therefore, never be used; in fact, I have discarded strychnine as a tonic in acute cases of neurasthenia of any variety. In the young and middle-aged it is liable to produce fibrillary muscular twitchings, and this is a distinct objection to its use in such cases. I am aware that Hartenberg holds the contrary view with regard to the efficacy of strychnine in neurasthenia, and, indeed, advises the "pushing" of the drug to doses of from $\frac{1}{8}$ gr. to $\frac{3}{20}$ gr., administered several times *per diem* by hypodermic injection. He believes that strychnine has not fulfilled expectations in the hands of many practitioners owing to its employment usually in small doses ($\frac{1}{30}$ gr.). He admits, however, that "there are isolated cases in which it appears to produce phenomena of excitement."[2] I am quite convinced, personally, that in cardiac neurasthenics the drug cannot be tolerated in small, let alone big, doses. I believe that much of the virtue ascribed to strychnine in neurasthenia by Hartenberg is due to the simultaneous exhibition of other measures he employs; unless, which would largely diminish the discrepancy in our views, he includes, in the category of neurasthenics, cases well on the road to recovery, in the convalescent stage, so to speak, or the large class which I designate pre-neurasthenic or neurasthenoid cases, in whom strychnine can often be employed with advantage.

In denouncing strychnine as an effective remedial agent, I am speaking of its action in cases of acute neurasthenia. The object in giving drugs to affect the nervous system directly, in the acute phases of this disorder, must essentially be to diminish the hyperactivity of the nerve centres at fault in the brain, particularly the emotional and vaso-motor mechanisms, but strychnine being a stimulant or excitant of nerve activity does the exact opposite of this.

Other "tonics" have been lauded by different writers on neurasthenia, but there are two only which I have given a fair trial, namely, damiana and phosphorus, drugs which have been highly recommended for this disease by Savill.[3] Personally, I have found these drugs to be absolutely valueless in neurasthenia.

Drugs, that have an Aperient Action.—Liquid paraffin, systematically used in large doses, an ounce twice or thrice daily, will help the most obstinate constipation in neurasthenia. Cascara sagrada is the next best aperient to use. It is manifestly a matter of the utmost importance for the neurasthenic to get a daily effectual evacuation of the bowels, whether by the exhibition of drugs or, which is better, by the inclusion in the dietary of food-stuffs, such as a large bowl of porridge in the mornings, which tend to help in this direction.

Drugs that promote Sleep.—It is, I am convinced, absolutely essential for the neurasthenic to get a sufficiency of sleep, ten to twelve hours daily, if possible.* The more sleep he gets, the better it will be for his nervous system, and the more readily will this respond to the other therapeutic measures designed to restore it to its normal balance. Whilst the administration of bromides and electricity undoubtedly produces a somnifacient effect, the habitual employment of a somnifacient likely to ensure sleep is always imperative in cases presenting troublesome insomnia. In all cases, therefore, in which insomnia is present, even in a mild degree, I administer hypnotics. Barbitonum, eight or nine grains given every alternate night only (to prevent the possibility of an accumulative action) before bedtime, I have found to answer the purpose wonderfully well,† or a sleeping draught containing potass. bromid. 15 grs., chloral. hydrat. 15 grs., tinct. opi. 15 m. is useful. *A propos*, reading before bedtime is apt, in the neurasthenic, to favour insomnia, and should, therefore, be prohibited.

(g) *Other Therapeutic Measures.*

A word or two is necessary in regard to the use of stimulants in neurasthenia. During the pre-neurasthenic state, or when the patients are well on the road to recovery from an actual attack, the moderate use of alcoholic beverages will do no harm, but stimulant is positively contra-indicated in cardiac neurasthenia, and is better left alone in other varieties of the disease during the acute attacks. Tobacco smoking, especially in the form of cigarettes, is, judging from the testimony of many patients, positively irritating and injurious, and should be prohibited, therefore, during the acute phases, and only permitted in wise moderation after subsidence of an acute attack. I am unable to reconcile this view of mine with the diametrically opposite opinion of Savill[4] on the sedative and prophylactic value of the "pipe" in this disease. Excessive sexuality and masturbation are distinctly injurious at all times in the neurasthenic, and during an acute attack sexuality should be absolutely forbidden.

---

* Jendrassik, Eulenburg, and Sir Clifford Albutt maintain that neurasthenics need less sleep than healthy persons, and are little the better for long spells of sleep. This statement is lacking in accuracy and precision. The truth is that neurasthenics may suffer from insomnia for prolonged periods with apparent impunity; those afflicted thus want more sleep but, if untreated, do not get it. The second part of the statement is only true when the disease is not, or improperly, treated.

† Although I have administered barbitonum repeatedly with impunity, the leading article in a recent issue of the *British Medical Journal* (February 9, 1918, p. 182) concerning its lethal effects ought, perhaps, to make one chary of employing it as an habitual routine.

When the patient has improved so far as to be able to mix with people, and break himself away from home surroundings without experiencing that mental perturbation characteristic of the neurasthenic state, I order a holiday to the country or seaside; for, as a rule, not until then, will a change of air and scene produce its maximum restorative effect. It is during this time, too, that a certain amount of work, to keep the patient's mind occupied, should be encouraged, so that, when the holiday is over, he may return to more or less active employment, care always being exercised to avoid exposing him to work involving mental strain or overstrain. It may, sometimes, indeed, be imperative, when the patient eventually returns to work, to advise a change of vocation, should his previous occupation be harassing in nature, and liable, therefore, to court the risk of recurrence of the neurasthenia.

B.—SUMMARY OF THE RESPECTIVE VALUES, AND DURATION OF EMPLOYMENT, OF THE VARIOUS THERAPEUTIC MEASURES, JUST DETAILED.

It is obvious that the value of any therapeutic measure must be judged essentially by its absolute or intrinsic effects. We may take it as axiomatic, therefore, that no remedial measure indicated in these pages to combat neurasthenia can possess any virtue whatever in this disease unless it can effect improvement, temporary or permanent, much or little, when used alone. The employment of a number of measures simultaneously, in this or any other disease, must obviously be for the purpose of producing beneficial effects that are either supplementary or complementary, in a word, cumulative.

For each of the therapeutic measures advocated, I claim the virtue that it exerts an ameliorating influence in neurasthenia.

Psychotherapy (*i.e.*, suggestion in the waking state), hydrotherapy, and medicinal remedies, when used by themselves, produce relief, as a rule, which, however, is at best, in most cases, temporary and not very pronounced, but sometimes they may fail entirely to ameliorate. Home isolation, when employed alone, has a much higher remedial value than either of these three, though it can seldom cure or permanently relieve the neurasthenic syndrome. D'Arsonval high-frequency electricity is, I am convinced, the most potent therapeutic measure we possess to combat this disease; when used alone, it will cure many cases of neurasthenia and relieve most. One cannot dissociate from its good results the beneficial influence of the patient's own unconscious auto-suggestion, once some improvement has been effected; for the cure of neurasthenia occurs by way of a *circulus virtuosus* of psychic events, just as typical pictures of this disease are produced by a vicious circle of events. The simultaneous employment of all the various therapeutic measures advocated will obviously effect amelioration more completely, more rapidly, and more lastingly than would the use of one alone.

I have already indicated how long electrotherapy has to be continued. Home isolation should be kept up for at least a month, but some patients may feel they can discontinue this sooner, others may require to maintain the practice longer. The patient naturally is the best judge, but I usually order at least about three weeks' or a month's isolation; thereafter he must not hasten to mix freely in company or with his environments, but break himself gradually in to his wonted habits in this direction. Barbitonum or other hypnotics must be discontinued so soon as insomnia ceases to be troublesome. The mixture of bromide and hyoscyamus should be given systematically *ter in die* during the first month of treatment, and thereafter gradually discontinued. Its exhibition may be renewed, if need be, at subsequent periods. The hydrotherapeutic measures indicated should be maintained throughout the duration of home isolation. When the patient is distinctly improved, they will be very effectively replaced by the daily warm bath.

C.—DEGREE OF CURABILITY OF THE DISEASE.

a.—*Prognosis in Untreated Cases.*

As indicated in my previous article,[1] the pre-neurasthenic state usually lasts for years; it may terminate with the death of the individual, who may thus live and die a pre-neurasthenic, or it may suffer temporary recoveries and relapses. The usual termination is an attack of true neurasthenia, such factors as environment, sphere of life, position, heredity, etc., naturally influencing the sequela in any individual case.

Concerning confirmed neurasthenia pura, improvement results sometimes, though very rarely, and temporary relapses and recoveries occur independently of treatment. The disease, however, is usually progressive, by which I mean that there is a never-ending stream of new phobias, aches, and other subjective manifestations, always lending new colour and aggravation to the patient's already hellish existence. I have not, however, personally known neurasthenia pura itself lead to a fatal issue, and I should be loth to accept statistics on this point unless the diagnoses were authoritatively established. Nerve tissue appears to be more resistant than other tissues to influences capable of inducing degenerative processes, as is evidenced, *inter alia*, by the slowly progressive character of many nerve affections, and the comparative freedom from involvement of nerve tissue in most general infective diseases. In like manner, derangement of psychic function, as observed in neurasthenia and hysteria, can and does persist for years without leading in the least to degenerative nerve changes, clinically evident, or imperilling the patient's life.

In cases of pure cerebrasthenia, more recently denominated psychasthenia, I conceive insanity to be a possible termination, although I have not met with that sequela. It is also very remarkable that organs, like the heart, secondarily affected in neurasthenia, can suffer neurasthenic functional impairment (tachycardia, palpitation, etc.) for prolonged periods, without undergoing any gross structural change (*e.g.*, dilatation and hypertrophy). I have known quite a number of cardiac neurasthenics who have suffered for a year and more from continuous tachycardia and palpitation, without any cardiac change resulting, as revealed by the ordinary clinical methods. Nevertheless, I entertain the latter eventuality (cardiac dilatation, etc.) as a theoretical possibility in untreated or improperly treated cardiac neurasthenics, of which, however, I have had no practical demonstration. Lastly, it may be stated under this heading that *felo de se* is a remotely improbable termination of this disease, although its possibility cannot be excluded.

b.—*Prognosis under Treatment advocated.*

The pre-neurasthenic state is highly amenable to treatment. The degree of curability of confirmed neurasthenics, treated as indicated, depends upon certain definite factors. These are—(1) the degree of inherited nervous predisposition; (2) the duration of the pre-neurasthenic state; (3) the duration of the attack before treatment was begun; (4) the age of the patient; and (5) the co-existence of any other devastating disease (*e.g.*, anæmia, etc.).

I am inclined to disregard statistics showing the degree of curability of neurasthenia, because I believe that the pre-neurasthenic state has been practically universally confounded with confirmed neurasthenia, and because the usual criterion is the Weir-Mitchell method. Generally speaking, I regard neurasthenia as a highly curable disorder. The first three factors do not vitally affect the degree of curability, but naturally the more intense the degree of morbid heredity and the more protracted factors two and three have been, the longer will it take to ameliorate or cure the patient. By curing a neurasthenic, I mean restoring him to his state of health before the attack. I do not believe that, except occasionally, one does establish in the neurasthenic a state of mental health and strength better than that enjoyed before the attack.

This is tantamount to saying that one cannot readily eradicate hereditary tendencies or acquired long standing pre-neurasthenic proclivities. Treatment will restore the patient to that state of mental health which will enable him to pursue his employment, fulfil his obligations to himself and to others with impunity, and find enjoyment in the pleasures of life; though in the large majority of "cured" cases, the patient will experience a trace of his former neurasthenic symptoms, if he exposes himself to mental overstrain.

In the cardiac neurasthenic, too, there is a tendency to easy excitability of the heart, even after recovery has taken place. Pure neurasthenia in any person of whatever age is amenable to treatment, but, generally speaking, in those past middle life, in whom the katabolic processes are in the ascendancy, the amenability diminishes in proportion as the age increases. Indeed, it is in the older patients, in whom emaciation and other changes have supervened as a consequence of the neurasthenia or as associated conditions, that we meet with the greatest obstinacy to treatment, which may sometimes, though not commonly, fail to effect any material amelioration.

If the therapeutic measures previously indicated are strictly carried out, distinct improvement will begin to be felt in most cases at the end of the first week of treatment; the improvement is progressive, and in about seven or eight weeks the patient can, as a rule, return to his normal duties, although it is never advisable to allow him to do so until at least the end of three months of treatment. To avoid the possibility of recurrence, the patient must be warned to husband his nervous resources by the practice of the prophylactic (physical and neuropsychic) measures previously indicated.

POSTSCRIPT.

Among the heterogeneous collection of functional nervous disorders denominated "war neurosis," a certain percentage of neurasthenia pura will be picked out. In army life, especially in war zone practice, neurasthenia becomes a convenient cloak to cover many diverse neuroses with widely differing clinical natures, and I have seen many cases "labelled" neurasthenia, that bore little or no resemblance to the syndrome of that disease. The duty devolves upon the physician at the base to discriminate the malingerer from the real, the functional from the organic, the neurasthenic from the neurasthenoid. With care, the diagnosis of neurasthenia pura is not at all difficult, but the ability to recognize it assumes positive importance when you are dealing with victims of the disease who are imprisoned in the pale of military existence and all that that implies, and are consequently deprived of the elementary liberties of civil life. Therefore, I would urge that it is more altruistic and pardonable to err on the side of leniency, and now and then to include the occasional malingerer and the neurasthenoid among those labelled neurasthenia rather than to exclude a single genuine sufferer.

Travelling northwards from London in September, 1916, I chanced to fall in with a soldier—a sufferer from as violent an attack of neurasthenia as one could possibly encounter, which had been shaping its way for years previously in civil life—who had eventually managed his transportation "home," after months of dire tribulation and suffering, during which time he more than once ran the risk of incurring military punishment for complaining of his trouble to an unsympathetic and unappreciative M.O.

It would appear, judging from the testimony of two discharged soldiers afflicted with typical and severe neurasthenia whom I very recently encountered, that the treatment they received at a military "neurasthenic institution"—without any material benefit resulting—embraced no distinctive measures beyond good feeding and gentle exercise in the open air. Whether this obtains generally in military neurasthenic institutions, I am not prepared to say. If it does, it is regrettable. The employment of the measures advocated as a routine treatment would probably yield good results in neurasthenic war institutions, even although institutional is substituted for home isolation, provided the environment of the patient is intensely sympathetic and congenial.

CONCLUSIONS.

1. Great attention should be paid to the question of prophylaxis of the predisposition. Timidity, selfconsciousness (manifested by

blushing, etc.), introspection, and "nervousness," constitute elemental traits of our potential neurasthenics, so that the physical training and moral education of children and adolescents exhibiting this combine of stigmata, should be such as will best tend to counteract these nerve "weaknesses," and raise the resistance of the psychical apparatus to emotive influences.

2. The symptoms constituting the precursory stage of the disease, the pre-neurasthenic state, must be treated as such, and not as isolated manifestations dissociated from the cause or causes upon which they fundamentally depend.

3. Neurasthenia is a highly curable disorder, the degree of curability being dependent upon the degree of morbid nervous heredity, the duration of the pre-neurasthenic state, the duration of the actual neurasthenia before the treatment advocated was begun, the patient's age, and general health. The prognosis is not excessively affected by the first three mentioned factors.

4. The disease is, as a rule neither self-limiting nor abortive, but indeed, progressive and persistent when untreated or improperly treated.

5. Neurasthenia is not usually curable in the sense that the patient's mental equilibrium can be brought up to the normal average, or the physiological ideal, the word "cure" in reference to this disease being employed as synonymous with restoring the patient's mind to the *status quo* before the neurasthenic syndrome first manifested itself.

6. The Weir-Mitchell method is not only not the treatment *par excellence* for this disorder, but in most cases of neurasthenia pura will fail to do much good, and in virtue of the time thus uselessly expended in its application, might exert an uncomforting and depressing influence on the patient's belief in recovery, and, therefore, actually aggravate the neurasthenia.

7. The best treatment for this disease is that comprising the therapeutic measures referred to, exhibited in combination, the most important of these being D'Arsonval high-frequency, and home isolation. Prolonged daily rest in its absolute form is also an outstanding and integral part of the "cure." Employing these measures as a routine method, symptomatic treatment will be reduced to a minimum.

REFERENCES.

[1] Bennett, S. H.: "Neurasthenia Pura," THE PRACTITIONER, February, 1918.

[2] Hartenberg: *Treatment of Neurasthenia*, translated by Playfair, p. 202. London, 1914.

[3] Savill, T. D.: *Lectures on Neurasthenia*, p. 121, 1908.

[4] *Ibid.*, p. 122.

◆

THE TREATMENT OF FÆCAL FISTULA.

By JAMES TAYLOR, F.R.C.S., Capt. R.A.M.C.

Surgical Specialist, Cambridge Hospital, Aldershot.

In civil practice, one frequently has to adopt operative measures for the closure of a fistula, which has resulted from inflammatory or other lesion of the bowel, or of an artificial anus which has been made in the course of the treatment of some disease of the intestine. In these days, one finds the operation necessary so much more often on account of gunshot wounds, in which a portion of the bowel has been shot away or has sloughed off, or the colon has had to be divided to allow of the healing of a wound which communicates with the lumen of the gut. I do not propose to say anything of those cases which result from malignant or other incurable disease, but to discuss only the traumatic or pathological variety, in which the fistula, when it has failed to close spontaneously, may be completely closed with the restoration of the patient to full health.

The old method of dealing with an artificial anus was to get rid of the spur by means of some kind of clamp, and then to try and bring the edges of the opening together. This was always rather uncertain, and even when it was successful it left a weak place in the abdominal wall. The ideal method is to dissect out the entire track, close the opening in the bowel, and then suture up the abdominal wall, preferably in layers. A small portion of the wall of the intestine has to be removed, or various lengths of it have to be resected, and the difficulty is to adopt some technique which will enable one to do this without getting the sutures, either in the bowel or in the abdominal wall, infected. There are cases, of course, in which the track is a long one, formed by loops of intestine matted together, and with a considerable amount of infection and inflammation among the loops. In these cases it is impossible to apply the direct method I have mentioned, and one has to be content with opening the abdomen at some other place and short-circuiting.

I have had a series of cases which were suitable for the direct method, and in which I removed various lengths of intestine, from a small portion on one side of the circumference to eight feet of bowel. I should like to describe some of the cases and give a short account of the technique which was adopted for their treatment.

One realizes that there must be considerable difficulty in getting primary healing, when trying to close an opening through which highly infected matter is constantly passing. The skin cannot be prepared beforehand, and apart from this there is always the danger of infection from the track itself. The end of the track must be temporarily closed to allow of the cleansing of the operation field, and care must be taken not to open into the sinus during the dissection.

After the patient is anæsthetized, the skin round the opening is swabbed with ether. In some cases it is possible to pass a purse-string suture round the opening and close it more or less in this way. It is usually, however, impossible to do this, and even if it can be done it should be supplemented in the way I am going to describe. An incision is made through the skin all round the opening, about a quarter of an inch from its margin, so that there is a small ellipse of skin with the opening of the fistula in the middle of it. This margin of skin is freed all round, so that the two halves of the ellipse can be brought together face to face over the fistula. A continuous linen suture on a cutting needle is now used to stitch the two edges of the ellipse together, and thus close the opening so securely that no leaking can take place during the rest of the operation. The whole field of operation is now thoroughly cleansed. The raw surface and suture line are sterilized with ether, and the skin over the surface of the abdomen is painted with iodine. Gloves are changed and fresh towels are arranged.

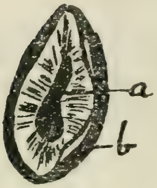


Fig. 1.
a. Fistula.
b. Line of skin incision.

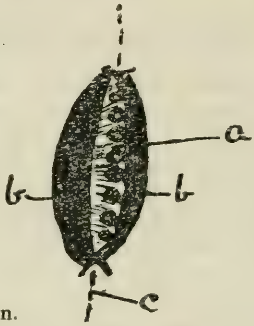


Fig. 2.
a. Skin sutured over fistula.
b. Raw surface.
c. Line of abdominal incision.

The abdomen is now freely opened by cutting upwards and downwards from the ends of the elliptical raw surface, and cutting through the whole thickness of the abdominal wall on either side of the fistulous track, so that it is completely divided from both

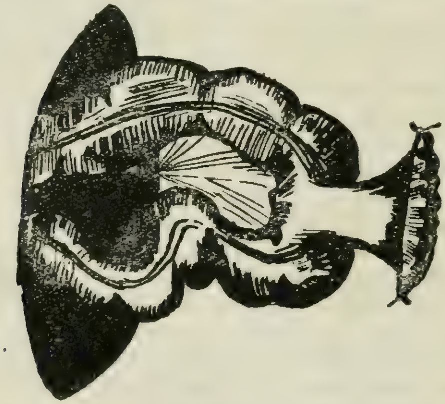


Fig. 3.—Loop of bowel freed.

edges of the incision and the bowel is seen lying free inside the abdomen with the sutured flaps of skin attached to it only by the small tube which forms the sinus. The bowel with this pedunculated tag of skin attached may now be drawn outside the abdomen, and dealt with as if it were a simple diseased piece of intestine. In the cæcum, the part of the wall where the sinus opens may be cut away, and the wound closed with a layer of through and through and a layer of Lembert sutures. The abdomen may then be closed in the ordinary way after fresh gloves have been put on. In other parts of the intestine it is usually necessary to resect a piece of bowel.

Private K. was operated on for acute gangrenous appendicitis. The wound was drained. About three weeks afterwards he was sent to an Auxiliary Hospital with the drain out and the wound rapidly healing. While in this hospital it was decided that further drainage was necessary, and a tube was inserted. He was returned to me shortly afterwards with a well-marked fistula discharging the contents of the cæcum. After waiting for two months without any signs of improvement taking place, the above operation was carried out. He was found to be suffering from an old tuberculous peritonitis with many adhesions. It was only necessary to remove a small part of one side of the cæcum. The wound healed by first intention, but about three weeks after the operation the skin wound broke down, a slow ulceration taking place. This had not healed completely when he left hospital, but he had a strong abdominal wall and his fistula was completely closed.

Private G. had a gunshot wound of the sacrum involving the rectum. A portion of necrosed sacrum projected into the bowel, and severe secondary hæmorrhage took place. Packing the rectum firmly with gauze was the only way of controlling it. A loop of pelvic colon was taken out, and a colotomy opening made. At the end of six months, when the sacral wound was healed, that opening had to be closed; and in this case the divided portion was resected and an end-to-end anastomosis made. I was not so successful in this case. Some suppuration took place which involved my sutures in the anastomosis, and for a time the patient had a fæcal fistula, but ultimately this healed and the patient made an excellent recovery.

Sergeant W. Gunshot wound, abdomen. A few days after his wound a large part of the ascending colon sloughed away, leaving him with a fistula in the right lumbar region. This was dealt with in the same way, the cæcum, ascending colon, and the beginning of the transverse colon being resected. There was a little mild suppuration in the wound in this case—I think from lighting up the latent infection in the dense scar tissue—but the end-to-side anastomosis which was made healed perfectly. The abdominal wall healed soon, though there was a good deal of tension in bringing the edges together. A month later the patient got a chronic obstruction from adhesions to the dense scar tissue in the neighbourhood of the wound, but he was completely cured by short-circuiting the ileum into the transverse colon.

Mrs. B. was admitted suffering from chronic intestinal obstruction of ten days' duration. The abdomen was enormously distended, constipation was practically complete, and there was occasional vomiting. A laparotomy was performed, and on opening the abdomen free gas escaped. All the large and small intestine was much distended, a malignant growth of the pelvic colon was found, and there was stercoral ulceration of the cæcum with perforation. The cæcum was taken outside the abdomen, the perforation closed, and a Paul's tube tied into the most healthy part of it. A tube was inserted into the pelvis and the abdomen closed. The bowel was so paralysed that it would not empty, and the patient almost died of toxic absorption therefrom; but by the end of three weeks she had got over the actual obstruction. The abdomen was flat and the bowels moved regularly through the artificial anus, and she was able to take food freely. She had, however, a growth at one end of her colon and a fæcal fistula at the other. As already described, the opening was temporarily closed, the abdomen freely opened, and the whole large bowel down to within about four inches of the end of the pelvic colon (a point about six inches below the growth) was resected. The last four feet of small intestine were so matted from the local peritonitis which had resulted from the perforation that they had to be resected, too. The end of the ileum was anastomosed into the end of the pelvic colon. Patient made an excellent recovery, and the wound healed by first intention.

Private C. Gunshot wound of the hip involving the rectum. A transverse colotomy had been done. When the hip wound was nearly healed, the fistula was closed by the above method, the whole colon down to the lower pelvic portion being resected. The patient made a good recovery, and the wound healed by first intention.

The patients stood the operation well. In the cases in which an extensive resection was done, Captain E. A. Scott administered stovain and ether, and in this way shock was practically eliminated. So far I have not lost any cases, and the fistula has always been closed. In my experience, the cases in which I carried out a free removal of intestine made the best recovery. It is of great importance to remove enough to get healthy intestine to suture, and to have the ends come comfortably together.

The fourth case reported is of special interest because the patient recovered after having an obstruction for such a long time that perforation of the distended bowel had taken place, and because of the remarkable improvement in her general health within forty-eight hours after the removal of eight feet of her intestine. She had all the appearances of chronic intestinal stasis, and the anatomical changes present in this condition were observed when the abdomen was opened, yet almost as soon as she recovered from the effects of the anæsthetic she looked and felt different. Her complexion cleared, her appetite came back; she ceased to be irritable and peevish, and became bright and cheerful. The bowels moved spontaneously about twice a day and she soon began to put on flesh. In fact, she underwent all the changes which Sir Arbuthnot Lane has so often described as occurring after colectomy for intestinal stasis.

In conclusion, I should like to thank Colonel Smith for permission to use the hospital records.

SOME PRACTICAL RESULTS OF THE MECHANO-THERAPEUTICS OF SEPTIC WARFARE WOUNDS.

By EDGAR F. CYRIAX, M.D.

London.

[With Plates I.–II.]

RECENTLY,[1] I published a short account of the theory and technique of mechano-therapeutics according to the late Henrik Kellgren's methods as applied to septic warfare wounds. During the last fifteen months, this treatment has been employed at the Swedish War Hospital in London in a number of cases, and I consider that a short account of some of them will prove acceptable.

The treatment employed consisted of the following manipulations :—1. Vibrations, stationary and concentrating, over and around the wound; 2. Stretching of the scar tissue; 3. Petrissage around the wound; 4. Frictions on the nerves of the wounded area; 5. Mobilization of the joints and muscles in the wounded area by means of passive, purely active, and resisted movements; each application taking from 10 to 15 minutes.

The results of the treatment are briefly as follows :—

1. Signs of healing begin very soon, often within 24 hours. 2. Pain and discomfort in the wound disappear very speedily. 3. The resulting scar is free from contractions, thickenings, and adhesions, so that the original contour is accurately reproduced. 4. There ensues complete functional restoration of joint-movement and muscle-power.

As regards the dressings and lotions employed for the wounds, which I shall describe, there is as a rule nothing to note, for there were no unusual deviations from the ordinary. In those cases in which no improvement had resulted until mechano-therapeutics were begun, no changes were made as regards dressings or lotions, in order that the effect of the new method could be gauged more accurately. With reference to the use of silver nitrate, two somewhat curious observations will be found in Reports Nos. 8 and 9.

As to the actual application of the treatment, I administered it personally in Cases 1 to 9; in Case 10, it was applied by Mr. Allan Broman, G.D., Stockholm, hon. superintendent of the hospital.

CASE 1.—Lieut. ——, wounded on September 21, 1916; while lying flat on his face a bullet entered between the vertebral column and the lower angle of the left scapula, and, passing across the spine in the lower dorsal region without injuring any of the bones, emerged in the right gluteal region. The patient was admitted to the Swedish War Hospital on September 26, 1916.

Examination, October 19, 1916.—The wound has considerably improved since admission. There is now present a long, lacerated, septic wound of the back, measuring 48 cm. in length, more superficial in its upper portion and becoming deeper as it proceeds downwards, so that in the lumbar region the oblique tendinous intersections of the multifidus spinæ, itself much lacerated, are exposed for about 10 cm. of their length. The edges of the wound are nearly everywhere abrupt and jagged and the floor is very irregular. The wound is roughly divided into three portions, the skin having just begun to grow right across it at the junction of the upper and middle thirds, and a slight constriction of the skin is visible at the junction of the middle and lower thirds. The maximum breadth of the three portions are as follows: upper, 3 cm.; middle, 5½ cm.; lower, 4 cm. There is a considerable amount of pain in the wound and back generally; it is aggravated by movements. The patient is able to get up and lie on a sofa, but his back feels very stiff and he is unable to relax it. Although the wound has improved since admission, he states that the pain and stiffness have only done so to a very slight degree. There is great weakness in the erector spinæ and right gluteal muscles.

---

[1] *Med. Press and Circ.* (N.S. XCIX. 291–4), and lecture to the Ling Association, *Journ. Scient. Phys. Train.*, 1917.

Treatment by mechano-therapeutics was begun on October 19, and was applied daily until December 8, in all 45 times. It consisted, at first, of the passive wound manipulations mentioned above, and passive movements of the trunk, the chief one being passive rotation; after one week the patient was able to execute the movement against resistance.

Progress.—October 20: The edges of the wound are not so abrupt, but are more shelving, and show an inward growth of epithelium along nearly the whole of their extent; there is an appreciable diminution of pain in the wound and back. October 21: Steady improvement in the healing process from to-day onwards, and to-day the patient is able to walk without any pain in the back. October 27: The pain and stiffness in the wound and in the back disappeared to-day, and did not return. December 4: The wound has practically healed, only some scabs remaining. December 8: The entire wound is now replaced by a finely striated pink scar, without any scabs; there are no adhesions or thickenings, and the scar is not elevated above the neighbouring tissues; the original contour of the parts appears to have been reproduced quite accurately. The scar varies in breadth from about 1 cm. above to about 2 cm. below, being nowhere more than 2 cm. There is perfect mobility of the back, and the erector spinæ and gluteal muscles are as strong as before the wound was inflicted. The dressings were discarded to-day, and the patient was discharged from the hospital on the following day.

The measurements of the wound were as follows:—

——	October.	November.						Dec.
	19.	4.	12.	20.	24.	27.	29.	4.
Upper third—	cm.	cm.	cm.	cm.	cm.	cm.	cm.	cm.
Length - - -	12	11	8¾	8¼	7	0		
Maximum breadth - -	3	1⅛	1	¾	½	0		
Amount of skin between upper and middle thirds.	Union just commencing.	4	7½	8½	10¼			
Middle third—								
Length - - -	16	16	12	11	10	7¼	Nearly healed.	0
Maximum breadth - -	5½	2¼	2	1¾	1½	¼	Nearly healed.	0
Amount of skin between middle and lower thirds.	0	0	Union just commencing.	1¼	2½	7¼		
Lower third—								
Length - - -	20	19½	13½	6½	5	3	0	
Maximum breadth - -	4	2½	1½	1½	1½	½	0	

Subsequent History.—In reply to a letter of mine, the patient writes on November 27, 1917 :—" My wound has scarcely given me any trouble since I left the Swedish War Hospital, the only thing that worries me being excessive friction. I can take part in athletics just as much as before being wounded, and last week I was the first officer to finish in a cross-country run of four miles."

CASE 2.—Lieut. ——, wounded on September 25, 1916, receiving a piece of shrapnel in the right gluteal region, as well as a missile in the right groin, which passed right through the abdomen, emerging in the lumbar region, but doing no damage to the viscera beyond a possible one to one ureter. Both entrance and exit wounds from the latter were practically healed before I saw the patient, only the gluteal one remaining. He was admitted to the Swedish War Hospital on October 6. On October 20 a skiagram was taken by Dr. C. Westman, the resident surgeon, which revealed several large pieces of shrapnel in the wound. Accordingly, on October 24, Mr. Mower White scraped the whole wound, opened up the sinuses and removed the pieces of shrapnel.

Examination November 3, 1916.—Some improvement has taken place since the operation. There is now present a large, fairly circular, septic wound, 15½ cm. wide, 7 cm. broad, and 3 cm. deep, in the right buttock. The edges are abrupt and jagged, the floor is irregular, and there are three small sinuses near the upper inner angle of the wound, each about 1½ to 2 cm. in depth. There is considerable pain round the wound, the gluteal muscles are weak and work stiffly, and there is great restriction of active extension, and both active and passive flexion of the hip-joint.

Treatment by mechano-therapeutics was begun on November 3, and was applied daily until December 22, in all 43 times. It consisted of the usual passive manipulations, together with certain resisted leg exercises, applied already at the first application, for the weakened gluteal muscles.

Progress.—November 4 : The pain disappeared after the first treatment, and did not return. November 5 : Edges more shelving, in-growth of pinkish epithelium all round the edges ; improvement in the healing process visible daily from to-day onwards. December 22 : The wound is much smaller, being 7½ cm. long and 1 cm. wide, without adhesions, contractions or thickenings, being 7½ cm. long and 1 cm. wide, without adhesions, contractions or thickenings, flush with and reproducing the normal contour of the surrounding tissues. The surrounding scar tissue is pink in colour and finely striated. The muscles of the right gluteal region, as tested by the resisted exercises, are now stronger than those in the left (uninjured) leg. The patient left to-day for a convalescent home. In reply to letters of mine, he informed me that by January 11, 1917, the wound had healed all but a scab, and the dressings had been discontinued. The scab finally fell off on February 2.

The measurements of the wound were as follows :—

——	November.					December.		
	3.	8.	16.	17.	27.	11.	19.	22.
	cm.	cm.	cm.	cm.	cm.	cm.	cm.	cm.
Length - -	15½	13	12¼	12	11	10	7½	7½
Breadth - -	7	6	4½	3½	3	1¾	1½	1
Depth - -	3	1¾	1	½	½	½	0	0

CASE 3.—Capt. ——, surgeon R.A.M.C., wounded October 14, 1916. He

received a bullet in the chest, with resulting hæmothorax and abscess in the pleura, the latter being drained by a posterior incision on October 24, and a minor wound in the left hand, the precise origin of which he is unable to trace. The patient was admitted to the Swedish War Hospital on November 12.

1. *Chest Wound.*

Examination, November 13.—A septic entrance wound is situated anteriorly over the sixth rib of the left side; it is small, measuring 1½ by 1 cm., is indolent with red everted edges, and the patient informs me that no improvement has taken place since its infliction. Posteriorly, on the chest-wall can be seen the incision through which the abscess was drained; its size is 7½ cm. by 1¾ cm., and is healing satisfactorily. No pain is present, but a sense of constriction is continually experienced in the anterior wound.

Treatment by mechano-therapeutics was begun on November 14, and was applied daily until November 27 on the posterior incision, and until December 4 on the anterior wound, in all 12 and 18 times respectively. It was limited to the usual passive wound-manipulations.

Progress.—November 14: The immediate effect on the anterior wound was the extrusion of some thick pus from the underlying tissues, and the sense of constriction disappeared from to-day, and did not return. November 15: The anterior wound shows signs of commencing healing. November 27: The posterior incision has closed up and is covered by a scab; dressings over it discontinued from to-day. December 1: The scab fell off to-day. December 3: The extrusion of pus from the anterior wound as a result of the vibrations ceased to-day. December 4: The wound has healed; the resultant scar is pink in colour, finely striated, no adhesions, thickenings or contractions.

2. *Hand Wound.*

Examination, November 13.—A small septic wound is visible over the inner aspect of the fifth metacarpal bone of the left hand. It is only about 1 cm. in both breadth and length and is quite superficial, but the patient informs me that, like the other wound, it has made no progress whatever since it was inflicted. The area around the wound is very painful and tender, more than can be accounted for merely by the wound *per se*. On closer examination, the base of the fifth metacarpal can be seen to be subluxated backwards.

Treatment.—The first thing I did was to reduce the displacement; this was quite easy. The base of the bone was vibrated for a few minutes, in order to reduce any muscular spasm around it, grasped between the finger and thumb, drawn away from the fourth metacarpal bone, in order to separate the articular surfaces of the joint between the two, and, with a sudden jerk, moved into its correct position, in which it remained. Not the slightest pain was caused by this proceeding, and the immediate result was that there ensued great amelioration in the pain and tenderness. The usual vibrations over the wound were then applied; next day their application caused the extrusion of a drop of thick pus, after which the pain and tenderness in the wound entirely disappeared. Pus reappeared daily, though in decreasing amount, whenever the wound was vibrated until November 18, after which it finally ceased. November 22nd: The wound is quite healed; treatment stopped.

The patient left the hospital on December 7.

Case 4.—Lieut. ——, wounded December 12, 1916. A piece of shrapnel so shattered the left thumb that what was left of it had to be removed by operation the next day. The patient was admitted to the Swedish War Hospital on December 17.

Examination December 29.—The wound has made considerable progress since admission. A lacerated septic wound measuring 7 cm. by 3¾ cm. can be seen over the site of the base of the left thumb. Its edges are somewhat everted, abrupt and thickened, specially at the carpal end; the floor is fairly healthy. There is some pain constantly present in the wound, also some numbness in the outer two fingers. As soon as the arm is dependent the hand commences to throb.

Treatment by mechano-therapeutics was begun on December 30, and was applied daily until March 9, in all 62 times. It consisted of the usual passive wound-manipulations, and the following resisted exercises, which were included at the first sitting:—Radial flexion, with the operator resisting, and the reverse, with the patient resisting; palmar and dorsal flexion applied in the same way, flexion and extension of the elbow joint, both with resistance from the operator.

Progress.—December 31: The edges are not so abrupt, everted or thickened, and a whitish-pink ingrowth of epithelium has commenced in places; by January 1 this was present all round the edges. From to-day onwards no more pain or throbbing when the arm is dependent. January 2: From to-day onwards no more numbness in the fingers. February 11: The wound has almost healed. February 15: Wound healed, but for a scab. On February 16 the scab fell off and the dressings were discontinued. The treatment was, however, continued until March 9, in order to get as good a scar as possible. The result was a light pink scar with fine striæ, no thickenings or adhesions; its edges were not well defined, but passed gradually into, and assumed the appearance of the surrounding skin; the size of the scar was about 6 cm. by 1¾ cm.

The measurements of the wound were as follows:—

——	Dec.	January.					
	29.	1.	3	8.	10.	16.	19
	cm.	cm.	cm.	cm.	cm.	cm.	cm.
Length - - -	7	6½	6¼	5½	5¼	4½	4¼
Breadth - - -	3¾	3½	3¼	2¾	2¾	2¼	1¼

——	January.		February.			
	27.	30.	2.	4.	11.	15.
	cm.	cm.	cm.	cm.	cm.	cm.
Length - - - - -	3	2½	1½	1½	⅛	0
Breadth - - - -	1¼	1¼	¾	½	⅛	0

Case 5.—Lieut. ——, wounded November 13, 1916, by a bullet passing behind the left mastoid process, splitting the skin over it and perforating the pinna. The patient was admitted to the Swedish War Hospital on November 21. Between that date and January 6, 1917, the wound in the ear healed

up without any trouble, but the scalp wound kept on partly healing and breaking down again, so that by the latter date it was in practically the same condition as when the patient was admitted. This had resulted in spite of having tried various antiseptics, having silver nitrate applied, etc.

Examination, January 6.—Above the left mastoid process can be seen a small superficial septic wound, about 2 cm. in length, imperfectly divided into two by a slight constriction of the skin; the left half measures ½ cm. in its widest part, the right half measures 1 cm. Surrounding the wound is an angry-looking red area, measuring 3¾ cm. by 2 cm. The edges of the wound are considerably thickened and everted above, but not so much below; the floor is fairly healthy.

Treatment by passive wound-manipulations was begun on January 6, and applied daily until January 31, after which it was applied seven times between that date and February 12, in all 28 times.

Progress.—January 7: Ingrowth of epithelium from the edges has begun. January 9: The constriction has become a bridge, thus completely dividing the wound into two. From to-day onwards, vibrations caused the extrusion of pus from the deep tissues. January 27: The wound is covered by a scab. February 13: The scab fell off; the wound has quite healed. The red area mentioned above is now lighter in colour, quite healthy in appearance, smaller (measuring only 2¾ cm. by 1¾ cm.), finely striated, and shows no adhesions or thickenings, its edges being quite level with the neighbouring tissues.

CASE 6.—Lieut. ——, wounded on April 23, 1917; a piece of shrapnel entered just below the left clavicle, passed superficially and settled about three inches below it; it was removed on April 24. The patient was admitted to the Swedish War Hospital on April 25.

Examination, April 26.—There are resent two pfairly clean lacerated septic wounds in the situations mentioned; the upper one measures 4¼ cm. by 2¾ cm. by 1¼ cm., the lower 4 cm. by 2 cm. by 1¼ cm. The lower wound is the more jagged of the two; the edges of both are abrupt and their floors very irregular. A sinus, originally present between the two, has now quite healed. There is a considerable amount of tenderness over both wounds, their intervening tissues and over the portion of the clavicle near the upper wound, where it is specially marked. The movements of the left arm are very restricted—for example, abduction through more than 45° is impossible on account of the pain thereby induced.

The treatment by mechano-therapeutics was begun on April 27, and was administered daily until May 17, in all 19 times. It consisted of the usual passive wound-manipulations, and the following resisted exercises for the weakened shoulder muscles, applied at the very first sitting; shoulder flexion with resistance applied at the patient's hand, and the reverse movement, with resistance from the patient; shoulder adduction and abduction similarly applied; carrying the whole arm backwards in the horizontal plane as far as possible, with resistance, and the reverse, with the patient resisting.

Progress.—April 28: Signs of healing in the lower wound, evinced by ingrowth of pinkish epithelium. April 29: The same is taking place in the upper wound. Great diminution of pain in both wounds. The movements of the arm are freer and the patient is able to comb his hair to-day, using his left hand. May 3: No more pain in either wound. May 7: Complete abduction of the left arm possible to-day. May 14: The upper wound has healed over. May 16: The same has happened to the lower wound. All dressings discarded to-day. Both scars are pinkish in colour, are finely striated, and show no adhesions or thickenings. The patient still suffers from a certain amount of tenderness over the clavicle, but otherwise has no subjective symptoms. He left the hospital on May 19.

The measurements of the wounds were as follows :—

	April.	May.							
	26.	2.	3.	5.	7.	10.	14.	15.	16.
Lower—	cm.	cm.	cm	cm.	cm.	cm.	cm.	cm.	cm.
Length - - - -	4	4	3½	3	2	2¼	1¼	¾	0
Breadth - - -	2	1½	1½	1½	1	¾	½	½	0
Depth - - - -	1¼	½	0						
Upper—									
Length - - - -	4¼	3½	3	3	3	2	0		
Breadth - -	2¾	3	3	2½	2¼	1	0		
Depth - - - -	½	0							

Case 7.—Lieut. ——, wounded on April 23, 1917; pieces of shrapnel caused a large lacerated wound of the left upper scapular region, which was laid open and scraped on April 25. The patient was admitted to the Swedish War Hospital on May 14.

Examination, May 6.—A large, jagged, lacerated, septic wound can be seen in the site mentioned ; its maximum breadth is 14½ cm. and its maximum width is 13½ cm. The edges are very irregular and abrupt; the floor is irregular, and is covered, in places, with greenish-yellowish crusts. Portions of the scapular muscles, specially the supraspinatus and the scapular attachment of the trapezius, are missing. (*See* Fig. 1.) A skiagram, taken on May 7 by Dr. Westman, showed no fracture, but revealed the presence of a large number of small pieces of shrapnel. The range of movements of the left arm is quite good, flexion and abduction being somewhat restricted, though there is, generally speaking, great weakness of all the muscles in the neighbourhood of the wound. In the wound itself there is continued pain and a " raw " feeling, together with a sense of constriction. External to the wound is an area of complete anæsthesia; it measures about 10 cm. by 5 cm.

The treatment by mechano-therapeutics was begun on May 7, and was applied daily, with two exceptions, until July 13, in all 54 times. It consisted of the usual passive manipulations and the same resisted movements as in the last case, these being included from the very first.

Progress.—May 11 : Ingrowth of pinkish epithelium from the edges. May 14 : Rise of temperature and pyrexia for some days, the maximum being 103°·6. During this period the greenish-yellowish crusts became alternately better and worse. Accordingly, on May 22, the temperature being normal, the wound was thoroughly scraped by Mr. Mower White. May 24 : There is a good deal of pain in the wound to-day; vibrations applied over it relieved it very considerably. May 25 : Ingrowth of epithelium has recommenced; no pain in the wound from to-day onwards. June 2 : Steady improvement in the wound and movements of the arm ; complete abduction of the humerus is possible, though it cannot be done unless, when the horizontal is reached, a somewhat sudden external rotation of the humerus is performed. June 16 : The wound is nearly healed, and it measures only 1 cm. by 1 cm. The surrounding scar is light pink, finely striated, only slightly constricted near the centre, wherein lies the open wound, and shows an entire absence of thickenings and adhesions (Fig. 2). The treatment had to be discontinued to-day, because the patient was sent to a convalescent home. Later on I heard that the wound had entirely closed by July 26.

The measurements of the wound were as follows :—

——	May.						
	7.	11.	18.	22.	25.	27.	30.
	cm.	cm.	cm.	cm.	cm.	cm.	cm.
A to B - - -	14½	14¼	13½	12½	13½	12	10½
C to D - - -	8¼	8	6¾	6¾	5¾	6¼	6
E to F - - -	13½	11	11	10½	12	10	10

After June 30, the C to D measurements could no longer be taken accurately, owing to changes in the shape of the wound :—

——	June.								July.				
	4.	7.	12.	19.	23.	26.	28.	30.	3.	7.	10.	13.	16.
	cm.	cm.	cm.	cm.	cm	cm.	cm	cm.	cm.	cm.	cm.	cm.	cm.
A to B -	9¼	8	6¾	6¼	5½	5	4¾	4	3¾	3	2½	1½	1
E to F -	9	8	6½	5¾	5¼	4¼	4	3½	2¾	2¾	1¾	1½	1

Subsequent Progress.—On December 10, I again saw the patient. His scar has given him no trouble whatever, excepting that he always wears a thin piece of gauze over it, or discomfort would be caused by his braces. The scar is quite light pink in colour, with numerous radiating striæ (Fig. 3). There are absolutely no adhesions, and the scar can be picked up between the forefinger and thumb and lifted off the underlying tissues for 1 cm. to 2 cm. in any part of it. The area of complete anæsthesia mentioned has regained some of its sensation. The muscles of the arm are quite strong; he can hold a 14 lb. weight horizontally outwards for 20 seconds.

CASE 8.—Lieut. ——, wounded on October 11, 1917, by a bullet entering over the left scapula and burrowing across the back, to leave it in the right interscapular region. A transient sensory paralysis of the entire body ensued, but completely passed off after about 20 minutes. Three days later a hæmatoma of the right wound was excised. The patient was admitted to the Swedish War Hospital on October 23.

Examination, October 26.—The entrance wound over the left scapula is practically healed. The exit wound, which is septic, jagged and irregular, lies almost horizontally, and extends from 3½ cm. to the left of the spine to 10½ cm. to the right of it (Fig. 4). A portion of the trapezius and erector spinæ are missing, so that the second rib is uncovered for about 2½ cm., as are also the spinous processes of the second and third dorsal vertebræ and a portion of the laminæ on both sides of the latter. The interspinous ligament between these two vertebræ is also missing. The lower edge of the wound is undermined so that the lowest portion of the wound cavity lies 1½ cm. below it. The wound, as a whole, is in fairly good condition, and healing. There is a considerable amount of pain in the wound, adjacent portion of the back, and neck. The movements of the arm are very restricted; passive

PLATE I.

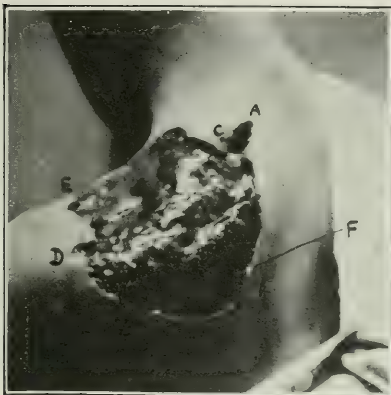


FIG. 1.

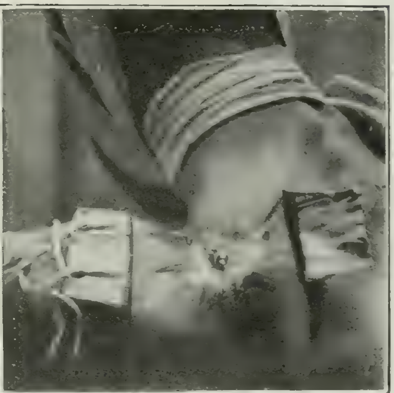


FIG. 2.

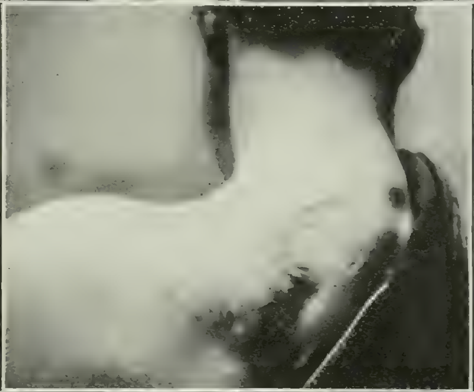


FIG. 3.

FIG. 4.

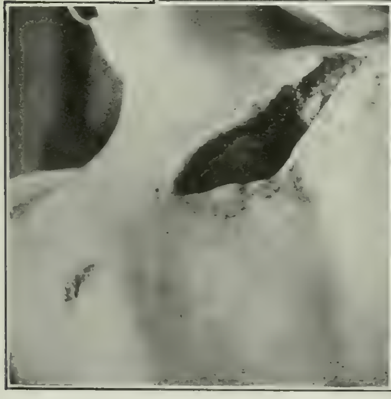


FIG 5.

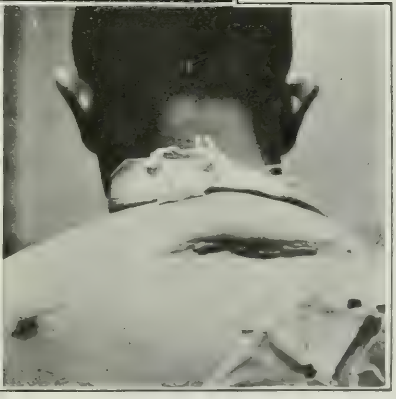


PLATE II.

FIG. 6.

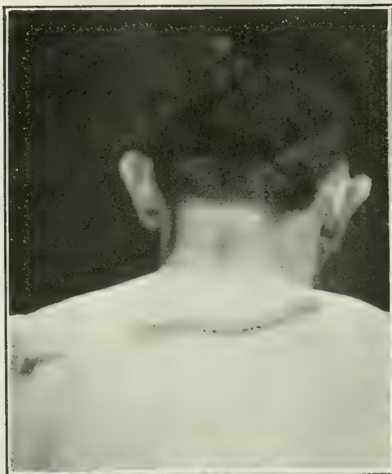
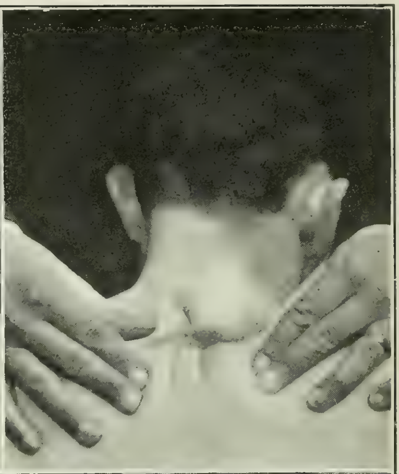


FIG. 7.



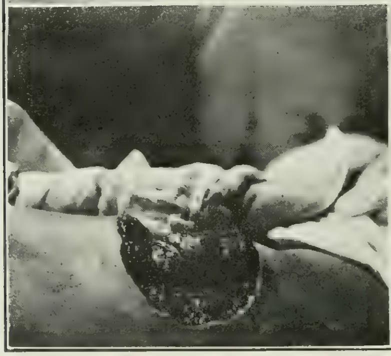


FIG. 8.

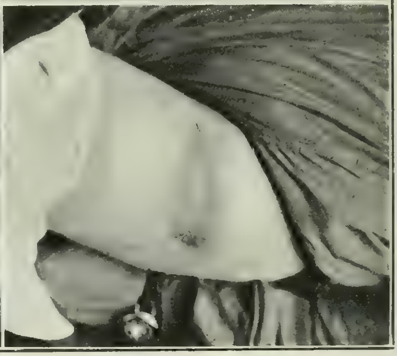


FIG. 9.

abduction can only be effected through 30°, and the range of active movement is practically nil, on account of the pain induced. Extension of the cervical vertebræ is very weak and causes acute pain in the head. The patient is listless and so weak that it tires him to speak. He is too exhausted to sit up, and cannot lie on his left side because this position causes too great an amount of pain in the wound.

The treatment by mechano-therapeutics was begun on October 26, and was administered daily (with one exception) until November 30, in all 30 times. Passive abduction and flexion of the arm were not administered until October 30, and were first applied with resistance, in the same manner as in Case 6, on December 2.

Progress.—October 27 : The wound is smaller than yesterday. October 28 : The amount of bony vertebræ exposed is diminishing. October 30 : The patient sat up for two minutes. October 31 : He sat up for fifteen minutes; no pain in the wound from to-day onwards. November 1 : General condition much improved; arm movements very free and the patient is able to stretch his arm vertically upwards. November 5 : The bony portions of vertebræ previously visible are now entirely concealed by granulations, and the inter-spinous ligament, which was missing, appears to be reforming. November 6 : The patient is able to lie on his left side to-day for the first time. November 17 : Patient able to walk for 15 minutes without backache. November 20 : The scar is much narrower and has some exuberant granulations; silver nitrate was applied to them in the left half of the wound, leaving the right untouched. This was repeated on November 23 and 28. November 30 : Although the immediate effect of the silver nitrate was to reduce the size of the granulations, those in the right half of the wound have also diminished in size, so that to-day there is no difference between the two. The wound is now represented by a thin red scar, 7½ cm. in length and ½ cm. in maximum breadth; granulations are present in its entire length. They are exuberant, spreading out so as to conceal the edges of the wound, and show signs of being strangulated in places. The scar is finely striated in its outer portions, still somewhat depressed, lying about 1 cm. below the level of the surrounding tissues, but shows no adhesions or thickenings (Fig. 5). There is no restriction whatever of any arm or neck movements; the patient assures me that the right arm is as strong as before the injury, though the left (unexercised) arm is still weak. There is no pain or discomfort of any sort in or near the wound. His general condition is excellent apart from some headache at times. The patient was sent to a convalescent home to-day.

The measurements of the wound were as follows :—

—	Oct.		November.						
	26.	29.	1.	5.	9.	12.	15.	19.	29.
	cm.	cm.	cm.	cm.	cm.	cm.	cm.	cm.	cm.
Total (horizontal) length of wound cavity.	14	12½	9		6	4¼	3½	0	
Vertical diameter over the spine.	3½	2½	1½	1½	1	¾	½	¼	¼
Maximum vertical diameter of the portion of the wound to the right of the spine.	4	2¾	2	2	1¼	1	¾	½	½
Maximum depth - - -	3	2½	1½	1¼	1	1	0		

Subsequent Progress.—I saw the patient again on January 3, 1918. He informs me that the wound finally healed on December 28, after which date the dressings were discarded. The two halves healed simultaneously, thus showing that in this case the ultimate effect of the application of silver nitrate was nil (*see* Case 2). The scar is now 13 cm. in length and from 1 cm. to 1½ cm. in breadth, is red in colour, finely striated and shows no thickenings, and is only slightly depressed below the level of the surrounding tissues. (*See* Fig. 6.) The scar is freely movable everywhere, and there is not a trace of any adhesion. (*See* Fig. 7, which shows lateral compression of the scar by the fingers.) There is no pain or discomfort in the scar excepting a certain amount of raw sensation on very cold and windy days. Headaches practically gone.

CASE 9. Lieut. ——, wounded on September 7, 1917; a bomb exploded and caused a large wound over the left great trochanter; two days later the "wound was excised." The patient was admitted to the Swedish War Hospital on September 13.

Examination, September 14.—The patient informs me that he has always been slow at healing after injury; for example, a simple uncomplicated fracture of the tibia did not finally heal until six months had elapsed. There is present a large septic lacerated wound, in fairly good condition, in the region of the left great trochanter, measuring 10½ cm. in width by 8 cm. in height and 2¼ cm. in depth on either side. The edges of the wound are fairly good, being somewhat shelving, but the upper lip is undermined about 1½ cm. The floor is irregular, with the anterior inferior spine projecting into it, and some of the muscles near it (for example, the rectus femoris) are missing. (*See* Fig. 8.) There is continued pain and sense of constriction in the injured area, and below the wound is a patch of complete anæsthesia extending downwards for about 12 cm. There is great weakness in the flexor and rotator groups of muscles of the hip joint, and limitation of these movements, both active and passive. For example, when the patient is in the recumbent position, he is entirely unable to lift the leg off the bed.

Treatment by mechano-therapeutics was begun on September 14, and was applied daily, with two exceptions, until November 23, in all 50 times. It consisted of the usual passive wound-manipulations, and from September 15 onwards, hip muscle exercises were included, *i.e.*, raising the limb off the bed, keeping the knee fully extended, this being performed with assistance during the first three days, purely actively during the next three, and with resistance applied over the dorsum of the foot on all subsequent occasions; external and internal rotation of the thigh, with resistance, applied over the outer and inner side of the knee respectively. The patient was allowed up and encouraged to try and walk.

Progress.—September 15: Ingrowth of epithelium from the lower edge visible. September 17: The general appearance of the wound is healthier; the pain disappeared to-day and did not return. September 18: The size of the wound has diminished; steady improvement from to-day onwards. September 21: The patient took a short walk of about 300 yards. September 25: The patient walked one mile in the morning and the same in the afternoon. October 1: No more sense of constriction in the wound when walking from to-day onwards. October 11: No more undermining of the upper lip. A low microbial infection of the wound began to-day, with resultant redness of the edges and surrounding tissues, and the appearance of three small boils in the vicinity. The patient was kept in bed until October 19, by which time the attack had fully subsided. Otherwise no change was made in the treatment. October 24: The wound is now about 7½ cm. by 3 cm., and is covered by exuberant granulations. Silver nitrate was applied to only their outer half on three occasions, namely, 24th, 25th and 29th. The immediate result was the reduction in their size, but by about November 6 there was no difference between the two halves. (*Vide* also Case 8.) Improvement steady, though somewhat slow, from October 19 onwards. By November 23 the wound was almost healed, measuring 5 cm. by 1⅛ cm.; the surrounding scar was finely striated, without any adhesions or thickenings, and level with the adjacent tissues. The movements of the left hip are normal and the muscles stronger than those of the right (uninjured) limb. The patient left the hospital on November 23. Later on he informed me that the wound had healed under a scab on December 10, and from that day onwards all dressings were discarded. There was no difference in the time of healing between the half treated by silver nitrate and the other half, both closing over equally and simultaneously. The scab fell off on December 29.

Subsequent Progress.—I saw the patient again on December 31. The scar is pink in colour; its edges are not well defined, but merge into the surrounding tissues, its size being about 8½ cm. by 3½ cm. It is finely striated, and shows no thickenings or adhesions; it can be picked up between the forefinger and thumb anywhere and raised 1 cm. to 2 cm. above the underlying tissues. The only abnormality is a slight constriction at its middle. (*See* Fig. 9.) The anæsthetic area below the wound is beginning to regain cutaneous sensibility.

The measurements of the wound were as follows:—

—	September.					October.			
	13.	18.	19.	22.	27.	1.	5.	9.	13.
	cm.	cm.	cm.	cm.	cm.	cm.	cm.	cm.	cm.
Vertical diameter - -	8	7¾	7½	7	6¾	6	5¼	5	4¾
Transverse diameter - -	10½	10	9½	10	9½	9½	8	8	7¾
Maximum depth - - -	2¼			1½	1	1	¼	0	

—	October			November.				
	19.	23.	29.	1.	9.	13.	16.	20.
	cm.	cm.	cm.	cm.	cm.	cm.	cm.	cm.
Vertical diameter - - -	4	3¼	2½	2¼	1½	1¼	1¼	1⅛
Transverse diameter - - -	7½	7¼	6½	6¼	5½	5½	5¼	5

Case 10. Lieut. ——, wounded on September 15, 1916, in the scalp by a bullet. The patient was admitted to the Swedish War Hospital on September 20. The wound was treated in the usual way, but by October 20 had made no progress at all beyond that some pain, originally present in the wound, had quite disappeared.

Examination, October 20.—A septic wound, somewhat circular in shape and measuring about 3 cm. in diameter, can be seen in the region of the lambda.

The edges are very everted, jagged, abrupt, and thickened, specially below, and the floor is irregular. The area immediately surrounding the scar is red and somewhat angry looking. There is no pain or discomfort in the wound, but a good deal of headache is present in the occipital region.

Treatment by mechano-therapeutics, limited to passive wound manipulations, was begun on October 20, and was applied daily until November 8, in all 18 times.

Progress.—The immediate effect of the first treatment was the extrusion of large quantities of puse, especially from under its lower edge, and, to a less extent, from six other foci in its floor. This expression of pus occurred every day until the wound healed, the amount of pus gradually decreasing on successive days. October 21: Signs of healing, evinced by ingrowth of pinkish epithelium, has begun, and could be seen to progress steadily day by day. The headaches began to diminish from this date. November 6: The wound has almost healed. The patient left the hospital, but came on two occasions, as an out-patient, for treatment. November 8: The wound has quite healed over; no adhesions, the edges are no longer thickened or everted, and both floor and edges are flush with the surrounding tissues. No more headache since about November 2. Dressings discontinued to-day.

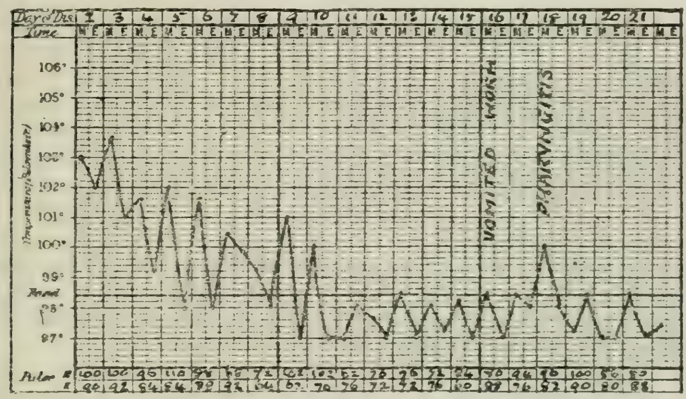
◆

AN INTERESTING CASE OF ASCARIS INFECTION.

BY GORDON WARD, M.D.

THIS case presented two different clinical pictures in a short time, and neither of these would have been easy to explain if the patient had not presented the most probable explanation by vomiting a round worm (Ascaris lumbricoides), and thereafter promptly recovering.

L. S., aged 28, was admitted to hospital suffering—apparently—from acute pulmonary trouble. The respirations were increased to 30 per minute and later to 40, but not above this. The temperature reached 103°·6 on the day after admission (*see* chart). The sputum was small in amount but was blood-stained, the blood being mixed with the sputum and evidently coming from the lungs, but no physical signs of any sort could be detected. Nevertheless it seemed extremely probable that he had some small focus of pneumonia, which was, perhaps, too deeply seated to give any signs. The sudden onset, temperature, and sputum all combined to make this the most probable explanation. It was expected that a few days would be ample to solve the diagnosis. It was nine days, however, before his temperature reached normal, and the sputum ceased on the third day. Unfortunately, it was never examined microscopically. No signs developed in the lungs.



Instead of getting better as his temperature fell, the patient became steadily worse, the symptoms of a second syndrome becoming slowly established. About the fifth day he was already eating little, had vomited once or twice, and was very sleepy and taking little notice of his surroundings. As he was a Greek, who had been living for years amongst French Canadians, his conversational powers were limited, and he was not expected to prove very sociable. By the tenth day he was vomiting everything he took, and the vomiting was projectile in character unaccompanied by nausea. His pulse fell at times to 60 (20 beats below his normal), and was extraordinarily soft and compressible. He took no notice whatever of his surroundings.

There was no head retraction or Kernig's sign, but the suggestion of cerebral trouble was, nevertheless, very forcible. He was removed to a side ward for lumbar puncture and observation as a case of probable meningitis. On the way he vomited a single round worm.

From this time on he began to recover rapidly, and, except for a slight pharyngitis of brief duration, was quite well three weeks after the commencement of his illness. The administration of santonin did not disclose any more worms.

It is now well known that the larvæ of ascaris lumbricoides develop from the eggs in the intestine, and forthwith generalize in the liver, lungs, etc. From the lungs they return viâ the trachea and œsophagus to the intestine, and there develop into the adult worm. The early symptoms in this case are exactly what we should expect to find if this was taking place, and since the patient was actually harbouring worms it seems at least possible that it was one of his own worms which laid the eggs, which developed the larvæ, which reached the lungs, which caused the cough, etc. Alternatively, he may have been reinforced by the recent ingestion of eggs, but this hypothesis is not required by the known facts and therefore has less to recommend it.

The cerebral symptoms were such as have been noted in children with some frequency as the result of ascaris infections, but are probably much rarer, and certainly less often noted, in adults. The simulation of meningitis is also of some small importance in these days. Their relief on the expulsion of the worm is what one would expect from analogy with such cases in childhood. It is impossible to say whether the symptoms were entirely reflex or whether there is also a toxic element. The latter is less likely.

One may mention, as a pure hypothesis, that it was the worm which was expelled which did actually lay the eggs, and that these developed only because the worm had by that time reached a portion of the digestive tract which made it possible for the larvæ to hatch out and generalize to the lungs, whereas eggs laid lower down the tract could not do so. The writer is not aware of any evidence to support this view, but it would meet two difficulties, viz., the fact that signs of such generalization of larvæ would appear to be uncommon in infected persons, and the coincidence of generalization and cerebral signs soon after in the same patient.

On this hypothesis the sequence of events would be as follows. The patient was—perhaps for a long time—infected with at least one round worm. This worked its way up the digestive tract, and in the upper reaches laid eggs which forthwith developed into larvæ and these reached the lungs. Experimentally, it has been proved that larvæ may be found in the trachea a week after ingestion of eggs. The larvæ caused some general pneumonitis of about a week's duration, and then ceased to affect the clinical picture. But the parent worm reaching the stomach, or near it, began to cause intense irritation and reflex phenomena, which only ceased when it was expelled by vomiting. This accomplished, the patient recovered.

That more accurate observations were not made during the course of the disease was due to its very anomalous nature, which did not in the least suggest the cause.

GUNSHOT WOUND OF THE ABDOMINAL CAVITY TREATED WITH ICHTHYOL AND GLYCERINE.

By CHARLES W. DUGGAN, Major R.A.M.C.

Military Hospital, Lincoln.

Lord Lister's epoch-making work on the antiseptic treatment of wounds appeared to satisfy most members of the medical profession prior to the war, but it has since been evident that the treatment of gunshot wounds involved something more than the use of a suitable antiseptic. Notwithstanding this, medical officers still following Lister's teaching one after another declare they have found the ideal antiseptic. Now the ideal antiseptic can hardly be said to exist, and I would strongly urge that all such enquiries should be directed to obtaining an ideal dressing.

Lister's work was incomplete in so far as he used only watery antiseptics, and recognized no other principle in the treatment of wounds. This was a matter of small moment, for surgeons in time of peace deal so largely with operation wounds, but in war another principle of equal or even greater importance than antisepsis, viz., osmosis, must be taken into consideration hence the efficient treatment of gunshot wounds involves the two principles of antisepsis and osmosis. Failure to understand the importance of the latter has led many in the profession to conclude that a satisfactory dressing for gunshot wounds has not yet been produced. To these I would point out that the two principles that I have enumerated, and without which all investigation is to a great extent futile, are fulfilled by a combination of ichthyol and glycerine.

For nearly three years I have been endeavouring to get this combination brought into general use, and I ask all who are interested in the subject of gunshot wounds, and who have not yet given it a trial, to do so.

Private C., Lincoln Regiment, was wounded on April 1, 1917, by a bullet which entered near posterior superior iliac spine on left side, traversing abdominal cavity and emerging 1½ inches above and external to anterior superior iliac spine of same side. He remained for a fortnight in the 1st Canadian Hospital, where wounds were dressed with wet boric dressing. He was then transferred to Endell Street Hospital, London, and remained there one month, boric dressing was still used and a drainage tube kept in sinus. After the wound had healed, he was sent to Eastbourne Convalescent Hospital for three weeks; after ten days' sick leave he joined at Grimsby, and ten days later he was sent back to France on duty. A fortnight later the wound broke down, and an abscess was opened at wound of exit in the 63rd C. C. Station. He was then sent to the 3rd Australian Hospital, where a large drainage tube was put in to drain a quantity of pus, fæcal in odour; Eusol foments were applied. On September 5, 1917, under chloroform, an incision was made from wound downwards for two inches through skin and deep fascia, the abscess was deeply in pelvis; another drainage tube was put in and syringed out with saline and afterwards Dakin's solution.

On September 13 he was sent to the Cowley Hospital, Oxford, where a smaller tube was inserted and Eusol dressing applied. After three weeks he was sent to Milton Hill Convalescent Hospital, where he remained from October 17 to January 7, 1918. The wound, which had healed, broke down again; another drainage tube was inserted, and Eusol dressing applied. After the wound had healed he came to Lincoln on January 16 to await a vacancy in a Command Depôt.

On February 13, 1918, he reported sick at the Military Hospital, Lincoln, with an inflamed scar at exit; evening temperature 101°·2 F., no rigors; equal parts of ichthyol and glycerine were applied to scar preparatory to operation next day. During the night the scar gave way, and a large quantity of pus, with a strong fæcal odour, escaped; the abscess cavity was syringed out with pure Sp. vini rectificat, and wound was dressed with equal parts of ichthyol and glycerine; the wound was dressed again at night. A probe could be passed into the abdominal cavity in the direction of the entrance scar for a distance of five inches.

On February 15 the discharge was profuse but less septic; no pain in wound, which was dressed once with equal parts of ichthyol and glycerine. Evening temperature 99° F. He slept well.

February 16.—Wound was dressed twice. Temperature normal. Patient has daily volunteered the statement that this treatment suited his wound better than any other.

February 20.—Wound has been dressed once daily since the 16th; there is less discharge; fæcal odour has been absent for some days.

February 27.—Scar and wound have contracted considerably; there is only a small quantity of pus. Temperature never rose above normal after the second day.

March 2.—Discharge slight; sinus two inches long syringed out with spirit and dressed with ichthyol and glycerine.

March 6.—Wound healed; a very small scar remains. Patient got up in the afternoon, and three days later he was able to walk about without discomfort.

In this case, I wish to direct attention to the following points :—

1. After he was wounded, and on the first and second occasions on which his wound broke down, a drainage tube was retained for four to five weeks in the abdominal cavity; on the third occasion on which the wound broke down no drainage tube was used.

2. The average time taken in healing with a drainage tube *in situ* was six weeks, but without one only 20 days.

3. The presence of a drainage tube caused discomfort to the patient, and actual pain at the time of dressing.

4. Although no drainage tube was used on the third occasion, premature closing of skin wound did not occur.

5. The skin-wound very quickly reacted to the combination of ichthyol and glycerine.

SPECIAL SCALES OF RATIONS FOR HOSPITALS.

The Ministry of Food has issued to the Local Food Offices particulars of special scales of rations for hospitals, sanatoria and kindred institutions. These scales have been drawn up by the Food Controller, after consultation with the Medical Officers of the Ministry of Food and of the Local Government Board, with the Medical Committee of the Food (War) Committee of the Royal Society, and with an Advisory Committee of Hospital Managers.

The scale for Civil General Hospitals is as follows, the quantities being the average per head per week, as purchased, for all classes of patients taken together:—

Meat (*a*)	16 oz.
Poultry or Game or Fish (*b*)	32 oz.
Sardines and other dried or preserved fish	4 oz.
Bacon (boneless) (*c*)	4 oz.
Bread	70 oz.
Sugar	8 oz.
Butter and margarine	4 oz.

Potatoes	70 oz.
Fresh Vegetables	28 oz.
Milk	pints 8·4
Jam	8 oz.
Rice (*d*)	8 oz.
Oatmeal and Pulses (*d*)	4 oz.
Eggs	4
Cheese (*e*)	4 oz.

Notes.

(*a*) The term meat denotes meat of all kinds, and the whole or any part of the allowance may be taken out in the form of butcher's meat.

(*b*) As from May 5th and until further notice a ration of 8 oz. of Bacon per head per week may, at the option of the Hospital, be substituted for the whole of the ration of 32 oz. of Poultry or Game or Fish per head per week.

(*c*) Or the equivalent current amount purchaseable on one coupon, whichever is the larger.

(*d*) In Scotland the scale will read, Rice, Oatmeal and Pulses, 12 oz.

(*e*) Cheese should be used as little as possible, and only the less solid kinds.

The Civil General Hospitals' scale is applicable to General Hospitals, to most Special Hospitals, to Poor Law Infirmaries, and to the Sick Wards of other establishments classed as Institutions under the Meat Rationing Scheme; and also, under certain conditions, to Convalescent Homes and Nursing Homes. It will apply not only to in-patients, but also to the medical, surgical and nursing staffs.

Special scales have also been drawn up for Children's Hospitals and for Tuberculosis Sanatoria (including special tuberculosis wards of other Institutions), whilst Naval and Military patients treated by understanding with the Naval or Military Authorities, are entitled to the Naval and Military Hospital Patient's scale. The medical, surgical and nursing staffs of these Institutions will receive the Civil General Hospitals' scale, except that at Sanatoria they will, if themselves tubercular, receive the same scale as the patients.

Applications to be registered as entitled to a special institutional scale must be made to the Local Food Office. It will be obvious that the same hospital may apply for more than one scale. There may, for instance, be Naval and Military patients, civilian patients and professional staff, and tubercular patients in special wards, besides other residents and non-residents receiving ordinary rations as members of the general public.

Ministry of Food, May 8, 1918.

Practical Notes.

CHLOROFORM WATER AS AN ANTISEPTIC LOTION.

Professor Quénu recently drew attention to the antiseptic properties of the vapour of chloroform. About three years ago, when the ordinary antiseptics in common use became scarce and very dear in price, Rengniez was called upon to find a suitable substitute for these, and suggested chloroform water. This liquid always remains quite limpid and free from any sort of growth in the ordinary bottles, even for years, and is not irritating, for it is frequently used in the treatment of gastric affections. He tried its effects first on a burn of the third degree, for which the usual treatment was apparently without benefit. The condition of the burn had been made worse by direct violence. The first dressing with chloroform water gave very great relief, and, when removed, came away without sticking, whilst the appearance was much improved. A compress of the water was applied night and morning, and healing was complete in eight days. Further experiences with burns and various other wounds, deep and superficial, have confirmed this satisfactory result, and the patients were always pleased when they knew that their wounds were to be dressed with chloroform water. It is used as a lotion and in compresses. It is made most easily, and is very inexpensive. Rengniez puts a quantity of chloroform in a 25-litre carboy, fills this up with water, and shakes it well. In half an hour the chloroform water is ready for use. The content of chloroform varies with the temperature, but the average proportion has been found to be equal to 9 per cent.—(*Journ. de Méd. et de Chir. prat.*, March 25, 1918.)

TREATMENT OF EXTERNAL AFFECTIONS OF THE EYE WITH SODIUM SULPHATE.

Abécassis was induced to try the effect of a saturated solution of sulphate of soda, by observing the good effects obtained in veterinary practice by the insufflation of the powdered salt into the eyes of horses, suffering from many different affections of the eye to which they are subject, such as acute conjunctivitis, wounds of the cornea and sclerotic, contusions of the globe, and others. He introduced the modification of this method into his regimental work for similar affections in the men, and obtained most satisfactory results. It was then tried in a field hospital, and was there found to reduce the inflammatory conditions, the conjunctival congestion, and the thick secretion that sticks the lids together. Relief is obtained in a few days in every case, and more quickly than with the ordinary collyria in use, in cases of catarrhal conjunctivitis, contusions, slight wounds of the cornea, particularly those caused by small pieces of metal. The affected eye is given an eye-bath twice a day, the eye being kept in this for about a quarter of an hour each time. Some tingling is produced at first, but this passes off soon after the bath. The eye-bath, when filled ready for use, should be placed on a table or some horizontal surface, and not held in the hand whilst the eye is being immersed.

Sodium sulphate is soluble in 0·3 of water, and saturation is obtained at 33° C., a suitable temperature for the bath. The solution is easily made by dissolving 1000 g. of the salt in 300 cc. of boiled water at 33° C. The ordinary salt supplied should be freed from impurities by re-crystallization from a saturated solution made at 33°, and drying the crystals thus obtained. It is suggested that this method of treatment should be tried in the inflammatory conditions produced by lachrymatory and irritant shells.—(*Journ. des Praticiens*, March 9, 1918.)

Reviews of Books.

Reagents and Reactions. By EDGARDO TOGNOLI, M.D. Translated by C. AINSWORTH MITCHELL, B.A., F.I.C. Pp. viii + 228. London: J. and A. Churchill. 6s. net.

THE literature of chemistry, physiology, and bacteriology is becoming so strewn with the names of the authors of reagents and methods of research, that a compendious work dealing with the reagents designated by their inventors' names is a necessity. A very exhaustive book has been in existence for a number of years, but it has not been available for all who would like to possess it. Therefore, it is a matter for satisfaction that Professor Tognoli has compiled the one named above, and it is further matter for satisfaction that Mr. Mitchell has provided it with an English garb. Its title might indicate that it was of a predominantly chemical character as contrasted with medical requirements. This is not so. A very large number of the tests have reference to bacteriological physiological, microscopical, and pharmaceutical examinations. All the more important clinical tests are also recorded. We find there are no less than 125 tests for urinary substances. It would be difficult to mention any chemical entity of the human organism for which a test is not forthcoming. These reagents are indexed alphabetically in the order of their authors' names, and the indication and description of the test is given in connection therewith. In another section is provided a list or "collective index of reagents and reactions of different substances," in which is first given in alphabetical order the substance to be sought for and then the names of the authors of tests for them. Particulars are provided, in the earlier part of the volume, concerning the strengths and the limits of purity of the more important chemical reagents. The medical man who is engaged in test-tube and microscopical investigations of even the most restricted character, will find this little volume to be indispensable. There are a few trivial matters which may be mentioned to indicate the need for a revision to bring the work up to the high-water mark of which it is worthy. The acids named as reagents ought to be described in such a way as to show they are solutions of the real acids when such is the case. Acetic acid, hydrochloric acid, nitric acid, etc., are only such solutions, and they should be associated with the percentage of the real acid (say, HCl. 31·79 per cent.) which they contain. In connection with Marsh's test for arsenic there is given the modification of Berzelius, but he is not mentioned, neither is his name given in the index, except as the inventor of a test for proteins. Arsenic testing leads one to look up Fleitmann's name, but in vain. Of this we must not complain because his method is now, perhaps, only a curiosity. But this is not the case in respect of Flückiger's modification of Gutzeit's test, which modification (the use of mercuric chloride paper) is the one universally used to-day, but which seems to be altogether omitted by Professor Tognoli. Under test papers, which are well described in a separate section, is mentioned Schiff's paper, but no method is given for preparing it. This is of considerable importance, for it should be prepared only when required. We have only noticed a few misspellings, such as Kleinemberg for Kleinenberg, and Focher for Tocher (p. 211). Technical matter of this kind is not a severe test of a translator's ability, but, as far as it goes, we may say that Mr. Mitchell's translation is everything that could be desired. It should be noted that he has filled some gaps which he found in the Italian edition. The volume is well printed and bound in the usual good taste of this firm of publishers.

Human Physiology. By Professor Luigi Luciani, Physiological Institute, Royal University of Rome. Translated by Frances A. Welby. In five volumes. Vol. IV. Edited by Gordon M. Holmes, M.D., "The Sense Organs." London: Macmillan & Co. 21s. net.

This volume of Prof. Luciani's extensive work deals with the subjects of cutaneous and other sensibility, taste, smell, hearing, and sight. In each section, an historical introduction is given followed by an exposition of the principal theories relating to a subject, with a critical discussion of them, histological details being introduced as required.

In the chapter on cutaneous sensibility, the English reader misses a reference to Head and Rivers's work on this subject, but this omission is made good by an editorial note in which the researches of these observers are summarized.

Chapter II. deals with the sensibility of the internal organs, including muscular sense and sexual instinct, and Chapters III.–VIII. deal with the organs of special sense on more or less conventional lines.

The final chapter discusses the psycho-physical phenomena of consciousness and sleep. The summary of the theories which have been advanced to account for sleep impresses the reader with their inadequacy. Dreams and telepathy are also discussed, including Freud's theory of the former. In view of the prominence which this has assumed in some quarters, Prof. Luciani's "summing up" may be quoted. He says: "Without denying the partial truth of this conception of dreams, it does not seem to us acceptable as a general theory. Consciousness for the sleeper is an immense world, more vast perhaps than consciousness in the waking state. It is impossible to limit it by Freud's narrow formula. Not all dreams are important and significant; many are produced by fortuitous stimuli. Even in connection with representative dreams we cannot accept Freud's opinion unreservedly. To assume that dreams are the symbolical expression of some important motive in the life of the sleeper and are therefore physiological in character conflicts with the fact that in sleep the power of perception and attention is very low, which again implies depression of will-power and of the faculty of perseverance to an end, and facilitates the invasion of the field of consciousness by a crowd of indifferent images."

As regards telepathic phenomena, a summary of the work of Myers and of Sir Oliver Lodge is given, and the remark is made that far too large a proportion of scientific men scorn to occupy themselves with them, and that both *materialism* and *vitalism* must continue to function as indispensable vehicles, as the necessary poles of future physiological discovery.

As a critical exposition of modern physiology, Luciani's Physiology must be regarded as holding a foremost place. A number of excellent figures in the text illustrate histological and other details

Syphilis and the Army. By G. Thibierge. Edited by C. F. Marshall. Pp. 210. London: University of London Press, Ltd. 6s. net.

It is a long time since we have had so much pleasure in reviewing a book on venereal diseases as the one before us. There is nothing new, although the chapters on prophylaxis and general management of these diseases in the Army make interesting reading. The great thing about the book is that it is simply written by a man who realizes that clinical knowledge is the most necessary for those who wish to diagnose and treat venereal diseases. Like a few other thinkers, the author has come to realize that the much-vaunted pathological and serological examinations have only very limited uses. We note that the author shares our opinion in regarding the reappearance of a chancre after intensive arsenical treatment as due to a recurrence and not to a re-infection. Relative to searching for the spirochæta or treponema pallidum, as the French prefer to call the organism, we find the following: "Indeed, it is by no means exceptional for it to be absent in undoubted cases of chancre." The author places little value on the Wassermann reaction, although he does not fail to give it its due in those late cases of syphilis which may possibly present a difficulty in differential diagnosis. As a guide to treatment we cannot do better than quote the author's own words: "It may be remarked that, in the regulation of this treatment I give no place to the indications furnished by the Wassermann reaction. . . . I consider, with many authors, that this reaction is of *no value* from the point of view of indication and regulation of treatment." We heartily recommend this practical book to all those interested in the subject, especially to those whose clinical experience is small, and, therefore, who are tempted to place too much reliance upon the laboratory results. If more stress was placed upon clinical diagnosis and the soldiers were treated more individually, much better results would be obtained in our own Army than is now the case; hence no medical officer who has to treat venereal diseases should fail to read this book.

The Treatment of Infected Wounds. By A. CARREL and G. DEHELLY. Pp. 238. London: University of London Press. 5s. net.

THE treatment of infected wounds is one of the greatest and most serious problems which the surgeon has been called upon to solve during the present war, and Messrs. Carrel and Dehelly have here set themselves to explain the rationale, technique, and results of the method which is known as the Carrel-Dakin treatment. That no perfect therapeusis is universally or even widely recognized is evident to any who has seen much of war wounds. It is, therefore, the duty of all to give a fair consideration and trial to any new method which may be suggested and not hastily to condemn it merely on theoretical grounds. The results reported of the Carrel-Dakin treatment are of such a nature as to call for extended use of that method, and every surgeon who undertakes it should be in possession of this handbook. The technique is somewhat complicated, and considerable experience is required for its perfection. Apparently only perfect technique can hope to be successful, while there are many points at which error may creep in. All these points are enumerated in this little handbook and the means for their elimination indicated.

The technique involves no new principle of any kind; it is an extension of Lister's original work, but no other workers have investigated the question of wound sterilization so thoroughly, carefully, and in such detail as is shown here in the first chapter.

In the second chapter, the preparation of Dakin's solution is minutely detailed, and forms the bed-rock and real essential of the whole process. The next two chapters deal with the technique of the sterilisation of wounds. There is little new in the mechanical and surgical steps to be taken, but those for the proper application and distribution of the antiseptic fluid deserve the closest attention. Chapter V. deals with the clinical and bacteriological examination of the wound and the control thereby of its progress. Though admittedly far from exact it forms nevertheless an integral part of the Carrel-Dakin treatment. The last two chapters concern the closure of wounds and its results. They give the reader pause for thought. The enormous reduction in suffering, the saving of life and limb, the economy in time, labour and dressings is almost beyond belief. By no other method have such results been obtained. No one who is not familiar with the Carrel-Dakin technique should fail to read the "Treatment of Infected Wounds," and no one who has read that book should fail to give the process thorough and sympathetic trial.

Preparations, Inventions, etc.

DORMIGENE.

(London : Messrs. Allen and Hanburys' Ltd., Bethnal Green, E.2.)

This product, chemically, is monobrom iso-valeryl-urea, and replaces the patented preparation known as " Bromural," which is now no longer obtainable. It is manufactured in this country under special Government licence. Like the urea compounds of similar nature it is a sedative and mild hypnotic, and acts upon the central nervous system, reducing its activity, but having no action upon circulation or respiration. It has no toxic effects upon either children or adults, and very rarely has been known to produce any ill consequences.

In a dose of 5 grains, given three times a day, it is used as a sedative in functional diseases of the nervous system, hysteria, neurasthenia, nervous excitability, and in the restlessness due to functional heart troubles. For an hypnotic effect a dose of from 5 to 10 grains is given in hot milk about half-an-hour before bedtime, and this may be repeated in three or four hours, if necessary. For this purpose it has proved of great benefit in insomnia of nervous origin, due to worry, overwork, physical and mental fatigue, and other disorders of functions. Its effect is produced in from fifteen to thirty minutes, and, though excreted fairly quickly, the sleep induced may continue for some hours.

It is prepared in tablets, containing 5 grains each, and issued in tubes of 10 tablets. It is also supplied as a powder in ½ oz. and 1 oz. bottles.

ACETYLSALICYLIC ACID. SODIUM SALICYLATE.

(London : Messrs. Menley and James, Ltd., Farringdon Road, E.C.1.

We have received samples of these two drugs manufactured by this firm, and find they compare most favourably in all respects with the products which formerly were the monopoly of the manufacturers on the farther side of the Rhine. The sodium salicylate dissolves completely in water in perfectly clear solution, and, when tested, is found to be chemically pure. As both these drugs are of proved value in therapeutics, it is a very real satisfaction to recognize that home supplies are becoming increasingly available, which are more than equal in quality to the original German productions.

MARIENBAD PULVERETTES.

(London : Messrs. Oppenheimer, Son, & Co., Ltd., Q. Victoria St., E.C.4.)

The official formula for the cholagogue supplement to the Spa treatment was as follows :—

℞	Ext. Cascaræ Sagrad.	gr. $\frac{1}{6}$.
	Ext. Belladonnæ	gr. $\frac{1}{30}$.
	Ext. Aloes Aq.	gr. $\frac{1}{3}$.
	Pulv. Rhei	gr. $\frac{1}{3}$.
	Podophylli	gr. $\frac{1}{12}$.

One or two were taken three times a day. In the pulverette form, the ingredients are enclosed in a thin chocolate shell, and are in no way compressed, so that, when swallowed they are in action without delay. The Marienbad " cure " can therefore be instituted in full at British spas. The pulverettes are put up, in any shape, in bottles of 100.

GENERAL INDEX

TO VOLUME C.

INDEX TO NAMES AND SUBJECTS.

PAGE

Abdominal cavity, Treatment of gunshot wound of with ichthyol and glycerine (C.W. Duggan) 505
Acetylsalicylic acid 512
Alcohol, Relation of, to mental states (Sir Robert Armstrong-Jones) (illustrated) 201
ARMSTRONG, W. H. STIRLING: Observations on hæmaturia 379
ARMSTRONG-JONES, Sir ROBERT: Relation of alcohol to mental states (illustrated) 201
Ascaris infection, Case of (Gordon Ward) (illustrated) 503
Asthma, Treatment of 297

B. Diphtheriæ, Culture medium for identifying 195
BARRY, D. T.: Trials of a surgeon pioneer 293
BENNETT, S. H.: Neurasthenia pura (illustrated) 157
—— ——: Neurasthenia pura, Treatment and curability of 431, 478
Beri-Beri, Three cases of (Kamel Yacoub) 290
Bipp 200
Blood-pressure cases, Importance of diastolic readings in high (O. K. Williamson) 134
BURLAND, CHARLES: Historical case of rickets 391

CAMERON, H. C.: Enuresis, etc., in childhood 112
Cancer and nitrogen (Jno. Thomas Shirlaw) 269
Carbohydrates, etc., Place and function of, in diet (David Curle) 250
Carcinomatous pericarditis (F. Parkes Weber) 246
Castor oil for dressing wounds 95
Chloroform water as an anti-septic lotion 507
COBBETT, LOUIS: "Influence of dose" and communicability of tuberculosis 402
Cocoa, cocoa and milk, etc. 100
COLE, PERCIVAL P.: Scalp flaps in plastic surgery of the face (illustrated) 461
COSENS, W. B.: Reflex phenomena produced by hernia 155
Cripples, Mental war (Sir Geo. H. Savage) 1
CURLE, DAVID: The place and function of carbohydrates, etc., in the diet 250

PAGE

CYRIAX, EDGAR F.: Mechano-therapeutics of septic warfare wounds (illustrated) 491

Dermatitis, Petrol (G. B. Page) 451
Dermatology, Recent advance in (J. M. H. Macleod) 124
Diabetes mellitus, Dietetic treatment of (R. T. Williamson) 35
Diastolic readings in high blood-pressure cases, Importance of (O. K. Williamson) 134
Dormigene 512
"Dose, Influence of," and communicability of tuberculosis (Louis Cobbett) 402
Dreams, A note on (F. Parkes Weber) 472
DUGGAN, CHAS. W.: Gunshot wound of abdominal cavity treated with ichthyol and glycerine 505

Editorial 401
Enucleation of tonsils, Prevention and treatment of hæmorrhage in (William Hill) (illustrated) 301
Enuresis, etc., in childhood (H. C. Cameron) 112
Eye, Treatment of external affections of with sodium sulphate 507

Fæcal fistula, Treatment of (James Taylor) (illustrated) 487
Fats, etc., Place and function of, in the diet (David Curle) 250
FORSTER, FREDK. C.: Management of neurasthenia, etc. 85

Garlic, Germicidal and therapeutic action of (W. C. Minchin) 145
Gestation prolonged to 12 months (J. T. Roger Miller) 94
Gonorrhœa, Chemo-therapeutic treatment of (J. E. R. McDonagh) 416
Graves's disease, Non-surgical treatment of (T. Bodley Scott) 442
GRAY, WINNIEFRED M.: Treatment of whooping cough by vaccines 91
GRIMBLY, ALAN F.: Cure of spinal concussion in warfare by suggestion 292
GRUNER, O. C.: False aims in medicine 381

PAGE

Hæmaturia, Observations on (W. H. Stirling Armstrong) - 379
Handley, Capt. W. S.: Radical cure of inguinal hernia (illustrated) - - - - - - 466
Health, Ministry of (A. W. Russell) - 70
Hepburn, James: Masturbation - 372
Hernia, Reflex phenomena produced by (W. B. Cosens) - - 155
Hill, William: The prevention and treatment of hæmorrhage in enucleation of tonsils (illustrated) - - - - - - 301

Impetigo contagiosa, a possible cause of acute nephritis (W. Fletcher Stiell) - - - - - 368
Indigestion (Guthrie Rankin) - 21
Inguinal hernia, Radical cure of (Capt. W. S. Handley) (illustrated) - - - - - - 466
Intestinal disorders, acute, Treatment of - - - - - - 396

Joints and spine, Treatment of tuberculous disease of (Sir H. F. Waterhouse) - - - 8

Lea, C. Edgar: Persistent tachycardia (illustrated) - - 141
Leyton, Helen, G.: Extension of vaccine therapy - - - 429
Leyton, O.: Differential stethoscope in diagnosis of myocardial changes (illustrated) - - - 224

McDonagh, J. E. R.: Venereal diseases - - - - - 41
—— —— Chemotherapeutic treatment of gonorrhœa - 416
Macleod, J. M. H.: Recent advances in dermatology - - 124
Marienbad pulverettes - - - 512
Masturbation (James Hepburn) - 372
Measles, The prevention of (James A. Milne) - - - - - - 376
Measles, The prophylaxis of - - 396
Mechano-therapeutics of septic warfare wounds (Edgar F. Cyriax) (illustrated) - - - - - 491
Medicine, False aims in (O. C. Gruner) - - - - - - 381
Mental war cripples (Sir Geo. H. Savage) - - - - - - 1
Middle ear catarrh, Ionic medication in (Arthur A. Pim) - - 440
Miller, J. T. Roger: Gestation prolonged to 12 months - - 94
Milne, James A.: The prevention of measles - - - - - 376
Minchin, W. C.: Germicidal and therapeutic action of garlic - - 145
Mirror writing, A case of (J. L. M. Symns) (illustrated) - - - 283
Moore, Irwin: Treatment of hæmorrhage following removal of tonsils (illustrated) - - - 334

PAGE

Mosquito-bites, Prevention of - 195
Munro, Donald J.: Pro-ether - 362
Muthu, C.: Tuberculosis in India - 277
Myocardial changes, The differential stethoscope in diagnosis of (O. Leyton) (illustrated) - - 224

Nephritis, acute, Impetigo contagiosa a possible cause of (W. Fletcher Stiell) - - - 368
Nervous diseases, Recent work in (H. Campbell Thomson) - - 235
Neurasthenia, etc., Management of (F. C. Forster) - - - - - 85
—— pura (S. H. Bennett) (illustrated) - - - - - - 157
—— —— Treatment and curability of (S. H. Bennett) - 431, 478
Nitrogen and cancer (Jno. Thomson Shirlaw) - - - - - - 269

Œsophagus, narrowed, Thread as a guide to instrumentation of (C. Hamilton Whiteford) - - 81
Otology, Retrospect of (Macleod Yearsley) - - - - - 242

Page, G. B.: Petrol dermatitis - 451

Papillomata and ingrowing toe-nail, Treatment of, with formaldehyde 297
Pericarditis, Carcinomatous (F. Parkes Weber) - - - - - 245
Peritonitis, Case of acute tuberculous (Kamel Yacoub) - - 453
Petrol dermatitis (G. B. Page) - 451
Pim, Arthur A.: Ionic medication in middle ear catarrh - - - 440
Plastic surgery of the face, scalp flaps in (Percival P. Cole) (illustrated) - - - - - - 461
Practical Notes: 95, 194, 297, 396, 454, 507; *Castor Oil for dressing wounds*, 95; *Treatment of Salonika Malaria*, 95; *Iodide of Starch for infected wounds*, 96; *Treatment of Pyodermatitis*, 194; *Prevention of Mosquito-bites*, 195; *Culture-medium for quickly identifying the B. Diphtheriæ*, 195; *Treatment of Papillomata and ingrowing Toe-nail with Formaldehyde*, 297; *Treatment of Asthma*, 297; *A modification of Reclus's Ointment*, 298; *Treatment of Acute Intestinal Disorders*, 396; *The Prophylaxis of Measles*, 396; *Vincent's Angina*, 397; *Hydrochloride of Emetine in the acute affections of the Lung in children*, 454; *Antimalarial action of Methylene-blue*, 455; *The local application of Aloes in the treatment of Insect-bites*, 455; *Chloroform water as an*

PAGE

antiseptic lotion, 508; *Treatment of external affections of the Eye with Sodium Sulphate*, 508.

PREPARATIONS, INVENTIONS, ETC.: 100, 200, 400, 512; *A Pneumatic Tourniquet for Amputation, Transport of wounded, etc.*, 100; *Cocoa, Cocoa and Milk, etc.*, 100; *The "Latapie" Sero-reaction for Syphilis*, 200; *Bipp*, 200; *"Hypoloid" Scopolamine Hydrobromide*, 400; *Roboleine*, 400; *Dormigene*, 512; *Acetylsalicylic Acid—Sodium Salicylate*, 512; *Marienbad Pulverettes*, 512.

Pro-ether (Donald J. Munro) - 362

Proteins, etc., Place and function of, in the diet (David Curle) - 250

Psychasthenia, etc., Management of (Fredk. C. Forster) - - 85

Pyodermatitis, Treatment of - 194

RANKIN, GUTHRIE: Indigestion 21

Rations, Special scale of, for Hospitals - - - - - 507

Reclus's ointment, A modification of - - - - - - - 289

REVIEWS OF BOOKS: 97, 196, 299, 398, 456, 509; *Clinical Bacteriology and Hæmatology for Practitioners* (W. D'Este Emery), 97; *Three Clinical Studies in Tuberculous Predisposition* (W. C. Rivers), 97; *A Manual of Surgical Anatomy* (Lewis Beesly and T. B. Johnston), 98; *The Treatment of Tuberculosis by means of Spengler's Immune Bodies* (I. K. Therapy) (Niven Robertson), 98; *Clinical Tuberculosis* (F. M. Pottenger), 99; *The Practitioner's Pocket Pharmacology and Formulary* (L. Freyberger), 196; *Public Health Nursing* (Mary Sewell Gardner), 196; *Kala-Azar; its Treatment* (Upendranath Brahmachari), 197; *A Manual of Practical X-Ray Work* (David Arthur and John Muir), 198; *A Class-book of Organic Chemistry* (J. B. Cohen), 199; *Tropical Diseases* (Sir Patrick Manson), 299; *What every Masseuse should know; Comfortable Grasps for Joint Movements* (Vera Waddington, with prefatory notes by Sir Rickman Godlee and Mrs. Annie E. Stewart and an introduction by Laura M. Fairbairn), 299; *Experimental Pharmacology* (Dennis E. Jackson), 300; Otosclerosis (Albert A. Gray), 398; *Practical Guide to Diseases of the Throat, Nose, and Ear* (Wm. Lamb), 398; *Gonorrhœa and its complications* (Georges Luys, Trs. and Ed. by A. Foerster), 399; *Minor Maladies* (Leonard Williams), 456; *Radiography and Radiotherapeutics*, Part I., *Radiography* (Robert Knox), 456; *Materia Medica, Pharmacy, Pharmacology and Therapeutics* (W. Hale White), 457; *Shell Shock and its Lessons* (G. Elliott Smith and T. H. Pear), 457; *Spiritualism and Sir Oliver Lodge* (Charles A. Mercier), 458; *Practical Points in the Diagnosis and Treatment of Heart Disease* (E. M. Brookbank), 458; *The Theory and Practice of Massage* (Beatrice M. Goodall-Copestake), 458; *Green's Manual of Pathology and Morbid Anatomy* (W. Cecil Bosanquet and W. W. C. Topley), 459; *How to enlighten our Children* (Mary Scharlieb), 459; *The Biological Aspects of Warfare* (Harry Campbell), 460; *Psychological Medicine* (Maurice Craig), 460; *Reagents and Reactions* (E. Tognoli, Trs. by C. Ainsworth Mitchell), 509; *Human Physiology* (Luigi Luciani, Trs. by F. A. Welby, Ed. by G. M. Holmes), 510; *Syphilis and the Army* (G. Thibierge, Ed. by C. F. Marshall), 510; *The Treatment of Infected Wounds* (A. Carrel and G. Dehelly), 511.

Rickets, Historical case of (Charles Burland) - - - - - 391

Roboleine - - - - - - 400

RUSSELL, A. W.: A ministry of health - - - - - - 70

Salonika malaria, Treatment of - 95

Sanatorium treatment for tuberculosis, Value and limitations of (Sir StClair Thomson) (illustrated) - - - - - - 101

SAVAGE, Sir Geo. H.: Mental war cripples - - - - - - 1

Scalp flaps in plastic surgery of the face (Percival P. Cole) (illustrated) 461

Scopolamine hydrobromide "Hypoloid" - - - - - 400

SCOTT, T. BODLEY: Non-surgical treatment of Graves's disease - 442

Septic warfare wounds, Mechanotherapeutics of (Edgar F. Cyriax) (illustrated) - - - - - 491

PAGE

Shell-shock, etc., Management of (Fredk. C. Forster) - - - 85

Shirlaw, Jno. Thomson: Nitrogen and cancer - - - - 269

Sodium salicylate - - - - 512

Spine and joints, Treatment of tuberculous disease of (Sir H. F. Waterhouse) - - - - 8

Spinal concussion in warfare, Cure of, by suggestion (Alan F. Grimbly) - - - - - 292

Starch, Iodide of, for infected wounds - - - - - 96

Stethoscope, The differential, in diagnosis of myocardial changes (O. Leyton) (illustrated) - - 224

Stiell, W. Fletcher: Impetigo contagiosa a possible cause of acute nephritis - - - - 368

Surgeon pioneer, Trials of (D. T. Barry) - - - - - 293

Symns, J. L. M.: A case of mirror writing (illustrated) - - 283

Syphilis, "Latapie" sero-reaction for 200

Tachycardia, Persistent (C. Edgar Lea) (illustrated) - - - 141

Taylor, James: The treatment of fæcal fistula (illustrated) - - 487

Thomson, H. Campbell: Recent work in nervous diseases - - 235

—— Sir StClair: Value and limitations of sanatorium treatment for tuberculosis (illustrated) - 101

Toe-nail, ingrowing, and papillomata, Treatment of, with formaldehyde - - - - 297

Tonsils, Treatment of hæmorrhage following removal of (Irwin Moore) (illustrated) - - - 334

—— Prevention and treatment of hæmorrhage in enucleation of (Wm. Hill) (illustrated) - - 301

Tourniquet, A pneumatic (illustrated) - - - - - 100

PAGE

Tuberculosis, Value and limitations of sanatorium treatment for (Sir StClair Thomson) (illustrated) - - - - - - 101

Tuberculosis in India (C. Muthu) - 277

—— Communicability of, and "Influence of dose" (Louis Cobbett) 402

Tuberculous disease of joints and spine, Treatment of (Sir H. F. Waterhouse) - - - - 8

—— peritonitis, Case of (Kamel Yacoub) - - - - - 450

Vaccine therapy, Extension of (Helen G. Leyton) - - 429

Venereal diseases (J. E. R. McDonagh) - - - - - - 41

Vincent's angina - - - - - 397

War cripples, Mental (Sir Geo. H. Savage) - - - - 1

Ward, Gordon: Interesting case of Ascaris infection (illustrated) - 503

Waterhouse, Sir H. F.: Treatment of tuberculous disease of joints, etc. - - - - 8

Weber, F. Parkes: Carcinomatous pericarditis - - 246

—— ——: A note on dreams - 472

Whiteford, C. Hamilton: Thread as guide to instrumentation of narrowed œsophagus - 81

Whooping cough, Treatment of, by vaccines (W. M. Gray) - - 91

Williamson, O. K.: Importance of diastolic readings in high blood-pressure cases - - - 134

Williamson, R. T.: Dietetic treatment of diabetes mellitus - - 35

Yacoub, Kamel: Three cases of beri-beri - - - - - 290

—— ——: Case of acute tuberculous peritonitis - - - 452

Yearsley, Macleod: Retrospect of Otology - - - - 442

ILLUSTRATIONS.

Pneumatic tourniquet for amputation, transport of wounded, etc.; p. 100, 1 figure.

The value and limitations of sanatorium treatment for tuberculosis; p. 101, 1 chart.

Case of persistent tachycardia: its cause and cure; p. 141, 2 figures.

Neurasthenia pura: its ætiology, symptomatology and pathogenesis; p. 157, 1 figure.

The differential stethoscope as an aid to the diagnosis of myocardial changes; p. 224, 3 figures.

A case of mirror writing; p. 283, 2 figures.

The prevention and treatment of hæmorrhage in enucleation of tonsils; p. 301, 22 figures.

Hæmorrhage following removal of the tonsils, and its treatment; p. 334, 8 figures.

False aims in medicine; p. 381, 2 figures.

Historical case of rickets; p. 391, 1 figure.

Scalp flaps in plastic surgery of the face; p. 461, 27 figures.

A method for the radical cure of inguinal hernia; p. 466, 2 figures.

The treatment of fæcal fistula; p. 487, 2 figures.

Some practical results of the mechanotherapeutics of septic warfare wounds p. 491, Plates I. and II., 9 figures.

An interesting case of ascaris infection; p. 503, 1 chart.

R
31
P7
v.100

Biological
& Medical
Serials

The Practitioner

PLEASE DO NOT REMOVE
CARDS OR SLIPS FROM THIS POCKET

UNIVERSITY OF TORONTO LIBRARY